



JOURNAL OF AIR TRANSPORTATION WORLD WIDE

Volume 3, Number 1 – 1998

The Proposed International Aeronautical
Monetary Fund—Legal and Practical
Implications

Ruwantissa I.R. Abeyratne

Intermodal Airport-to-City-Center Passenger
Transportation at the 20 Largest U.S. Air Carrier
Airports: The Past, Present, and Future

*Henry R. Lehrer and
Aimee Freeman*

Human Factors: Tenerife Revisited

*John McCreary, Michael Pollard,
Kenneth Stevenson and Marc B. Wilson*

Aviation/Aerospace Teacher Education
Workshops: Program Development and
Implementation

Mavis F. Green

Air Transport Liberalization in Europe:
The Progress So Far

Peter Morrell

Towards an International Open Skies Regime:
Advances, Impediments, and Impacts

Rex S. Toh

Trends in Airline Labor Productivity and
Cost in Europe

Fariba Alamdari

Editorial Board

Membership on the JATWW Editorial Board is by invitation and approval of the board. This appointment should be viewed as professional recognition of significant career achievement and high academic/industry distinction. Applicants will generally be senior faculty members (graduate faculty standing where applicable), or persons who have attained substantial industry or public service achievement in the case of practitioner members. Term of appointment is three years with opportunity to request renewal. For membership consideration, submit a curriculum vita or industry resume and statement of interest to: Dr. Brent Bowen, Editor.

Ramesh Agarwal
Wichita State University

Ballard Barker
Florida Institute of Technology

Brent Bowen
University of Nebraska at Omaha

Tim Brady
Central Missouri State University

Thomas Carney
Purdue University

Larry Carstenson
University of Nebraska at Kearney

Tom Connolly
Embry-Riddle Aeronautical University

E. Julius Dasch
NASA Headquarters

David Downing
Kansas Space Grant Consortium

Gerry Fairbairn
Daniel Webster College

John Fitzpatrick
College of Aeronautics, New York

Laurence Gesell
Arizona State University

Atef Ghobrial
Georgia State University

Vishwa Gupta
Bandku Aerospace Pvt. Ltd., India

Guy Smith
Northwest Airlines

Scott Hamilton
Civil Air Patrol, Maxwell AFB

Abe Harraf
Embry-Riddle Aeronautical University

Dean Headley
Wichita State University

William Hiscock
Montana Space Grant Consortium

Lofti Kaabi
Institut Regional des Sciences Informatiques
et des Telecommunications, Tunisia

Igor Kabashkin
Riga Aviation University, Latvia

Gary Kiteley
University Aviation Association

Hart Langer
United Airlines

Mike Lavelle
The Boeing Company

Henry Lehrer
University of Nebraska at Omaha

Frank Mitchell
Wichita State University

Mac McClure
Oklahoma State University

C. Elaine McCoy
Ohio State University

Graeme McDowal
Air New Zealand

Phillip Moore
University of Newcastle, Australia

Kamal Naguib
World Aerospace Education Organization

David NewMyer
Southern Illinois University at Carbondale

Tae Oum
University of British Columbia

Korham Oyman
Jordan University of Science and Technology

N. Thomas Stephens
Florida Institute of Technology

Kim Stevens
Nebraska Department of Aeronautics

Abdul Wahab Teffaha
Arab Air Carriers Organization

Kenneth Williams
Oklahoma State University

**Journal of
Air Transportation World Wide**

Volume 3, Number 1 – 1998

ISSN Number: 1093-8826

Journal of Air Transportation World Wide Vol. 3, Number 1 – 1998
Brent D. Bowen, Editor

©1998, Aviation Institute, University of Nebraska at Omaha

Published by:

Aviation Institute
University of Nebraska at Omaha
6001 Dodge Street
Omaha, Nebraska 68182-0508
USA

Phone: (402) 554-3424
Fax: (402) 554-3781

E-mail] journal@fa-cpacs.unomaha.edu

World Wide Web] <http://cid.unomaha.edu/~unoai/journal>

Printed by: University of Nebraska-Lincoln Printing Services

Published as a not-for-profit service of the Aviation Institute. Funded in part
by a grant from the NASA Space Grant College and Fellowship Program.



The University of Nebraska does not discriminate in its academic,
employment or admission policies and abides by all federal, state
and regental regulations pertaining to same.

About the Journal of Air Transportation World Wide

The *Journal of Air Transportation World Wide's (JATWW)* mission is to provide the global community immediate key resource information in all areas of air transportation. Our goal is to be recognized as the preeminent scholarly journal in the aeronautical aspects of transportation. As an international and interdisciplinary journal, the *JATWW* will provide a forum for peer-reviewed articles in all areas of aviation and space transportation research, policy, theory, case study, practice, and issues. While maintaining a broad scope, a focal point of the journal will be in the area of aviation administration and policy.

Development:

The *JATWW* was conceptualized to fulfill an international void of scholarly publications in this area as identified by the primary organizers. It is envisioned that aviation leaders will utilize the *JATWW* as a key decision-making tool. Scholarly rigor and standard will be uncompromised with regular evaluation by the Editorial Board and Panel of Reviewers.

Scope:

The *JATWW* will accept manuscripts on all topics that relate to air transportation, both technical and non-technical. The Panel of Reviewers represent the interdisciplinary nature of air transportation to ensure review by recognized experts. Broad categories of appropriate topics include, but are not limited to:

- Aviation Administration, Management, Economics, Education, Policy, Engineering, Technology, and Science
- Intermodal Transportation
- Aerospace Education and Flight
- Airports and Air Traffic Control
- Air Transportation Systems: Domestic, International, Comparative
- Aviation/Aerospace Psychology, Human Factors, Safety, and Human Resources
- Avionics, Computing, and Simulation
- Space Transportation Safety, Communications, and the Future
- Other areas of air and space transportation research, policy, theory, case study, practice, and issues

Dissemination:

The *JATWW* is catalogued at key research libraries world wide, including the U.S. Library of Congress. It is also indexed in Aviation Tradescan, the National Research Council TRIS Index, and ERIC Resources in Education. In addition, the *JATWW* is available through inter-library loan at the University of Nebraska at Omaha Library and the Riga Aviation University in Latvia via accessing the

global OCLC inter-library loan network. A permanent archive is maintained at the University of Nebraska at Omaha. Annual subscriptions are available for \$35 for individuals and \$68 for institutions. For subscriptions outside the U.S. add \$20. Payments may be made by check or purchase order to the UNO Aviation Institute.

Host Organization:

University of Nebraska at Omaha (UNO) — Nancy Belck, Chancellor;
Ernest Peck, Vice Chancellor for Academic Affairs

Co-Sponsor Organizations:

American Society for Public Administration — Van Johnston, Chair Transportation Section
Air Transport Research Group — Tae Oum, Chair
NASA Kansas Space Grant Consortium — David Downing, Director
NASA Nebraska Space Grant Consortium — Brent Bowen, Director
NASA Space Grant College and Fellowship Program, Aeronautics Working Group — Julius Dasch, Program Manager
Riga Aviation University, Latvia — Boris Heimanis, Rector
World Aerospace Education Organization — Kamal Naguib, Chairman

Supporting Organizations:

Aviation Institute, UNO — Brent Bowen, Director
Center for Public Affairs Research, UNO — Russell Smith, Director
College of Public Affairs and Community Service, UNO — David Hinton, Dean
Department of Public Administration, UNO — B.J. Reed, Chair
University Library, UNO — Robert Runyon, Director

JATWW Personnel:

Editor: Brent Bowen, Aviation Institute, UNO
Co-Editor: Igor Kabashkin, Riga Aviation University, Latvia
Assistant Editor: Fred Hansen, Aviation Institute, UNO
World Wide Web Coordinator: Scott Vlasek, Aviation Institute, UNO
System Supervisor: Tim Himberger, College of Public Affairs and Community Service, UNO
Library Liaisons/Advisors: Carol Zoerb and Mel Bohn, University Library, UNO
Publication Specialists: Joyce Carson, Layout and Melanie Hayes, Copy Editor, Center for Public Affairs Research, UNO; Marian Gramlich, Public Relations, UNO; Michaela Schaaf, Stylistic Reviewer, NASA Nebraska Space Grant Consortium, UNO; Amanda Talmadge, Marketing Consultant

Panel of Reviewers

Reviewers are appointed by the Editor to represent all elements of aviation and space transportation scholarship and practice. An appointment to the Panel of Reviewers recognizes professional and academic achievement. For membership consideration, submit a curriculum vita or statement of interest to: Dr. Brent Bowen, Editor.

Members:

Densel Acheson
University of Nebraska at Omaha

Fariba Alamdari
Cranfield University, England

Herbert Armstrong
Dowling College

Kenneth Barnard
Kansas State University

Jon L. Bryan
Bridgewater State College

Gail F. Butler
Dowling College

Gerald Chubb
Ohio State University

James Crehan
University of Alaska

Sergey Doroshko
Riga Aviation University, Latvia

Alexander Fedotov
Riga Aviation University, Latvia

E. Terence Foster
University of Nebraska - Lincoln

Terry Gibbs
University of Nebraska at Kearney

Mavis Green
University of Illinois, Savoy

Scott Hall
Chicago Express Airlines

William C. Herrick
Middle Tennessee State University

Jeff Johnson
University of Nebraska at Omaha

Alexander Kalmykov
AMR SABRE

John M.C. King
Air New Zealand

Kyung-Sup Lee
Korean Air

Jacqueline Luedtke
Utah State University

Rebecca Lutte
University of Nebraska at Omaha

Keith Mason
St. Cloud State University

William C. McCurry
Arizona State University

Pat McKinzie
Mankato State University

A. Keith Mew
California State University – Los Angeles

Terry Michmerhuizen
Parker Berteau Aerospace, Michigan

Boris Mishnev
Riga Aviation University, Latvia

Gary Northam
Saint Louis University

Y.S. Park
Korean Air

Manoj Patankar
San Jose State University

Stephen Quilty
Bowling Green State University

Dawna Rhoades
Embry-Riddle Aeronautical University

Panel of Reviewers

Dutchie S. Riggsby
Columbus College

Robert F. Ripley
Auburn University

David Roy
Embry-Riddle Aeronautical University

Stephen M. Rutner
Georgia Southern University

Vadim Stroitlev
Riga Aviation University, Latvia

Hope Thornburg
St. Cloud State University

Mary Ann Turney
Dowling College

Victor Ujimoto
University of Guelph, Canada

Bijan Vasigh
Embry-Riddle Aeronautical University

Liz Ward
NASA Langley Research Center

Thomas Weitzel
Trans World Airlines Inc.

Malcolm Yeo
Edith Cowan University, Australia

Jule Zumwalt
World Aerospace Education Organization

Table of Contents

Volume 3, Number 1 — 1998

Articles

- The Proposed International Aeronautical Monetary
Fund — Legal and Practical Implications · · · · · 1
Ruwantissa I.R. Abeyratne
- Intermodal Airport-to-City-Center Passenger Transportation
at the 20 Largest U.S. Air Carrier Airports: The Past,
Present, and Future · · · · · 12
Henry R. Lehrer and Aimee Freeman
- Human Factors: Tenerife Revisited · · · · · 23
*John McCreary, Michael Pollard, Kenneth Stevenson,
and Marc B. Wilson*
- Aviation/Aerospace Teacher Education Workshops:
Program Development and Implementation · · · · · 32
Mavis F. Green

Special Section: Air Transport Research

Group Conference, Vancouver, B.C.

Guest Editor: Tae Oum

- Air Transport Liberalization in Europe: The Progress So Far · · · · · 42
Peter Morrell
- Towards an International Open Skies Regime: Advances,
Impediments, and Impacts · · · · · 61
Rex S. Toh
- Trends in Airline Labor Productivity and Cost in Europe · · · · · 71
Fariba Alamdari
- Index of Past Issues · · · · · 89**
- Guidelines for Manuscript Submission · · · · · 91**
- Order Form · · · · · 95**

THE PROPOSED INTERNATIONAL AERONAUTICAL MONETARY FUND — LEGAL AND PRACTICAL IMPLICATIONS

Ruwantissa I.R. Abeyratne
Montreal, Canada

ABSTRACT

The proposed international aeronautical monetary fund has its genesis in the Latin American Civil Aviation Commission (LACAC) which proposed the inauguration of the fund to finance air navigation services provided by the satellite based Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) system. It was the consensus of LACAC that the fund should be created by international agreement with an international bank established to receive and administer the financing of the CNS/ATM. The overriding principle of the aeronautical monetary fund remained that its administration should be supervised by the International Civil Aviation Organization. This paper will introduce the conceptual and practical evolution of the aeronautical monetary fund from its inception to date and analyze its legal and practical implications for the future of civil aviation.

INTRODUCTION

The proposed international aeronautical monetary fund has its genesis in the Latin American Civil Aviation Commission (LACAC) which, at its Panel meeting on 13–14 June 1994 held in Salvador, Brazil, proposed the inauguration of the fund to finance air navigation services provided by the satellite based Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) system. It was the consensus of LACAC that the fund should be created by international agreement and that the entity which would receive and administer the financing of the CNS/ATM system under the fund should be an international bank established for that purpose. The overriding principle of the aeronautical monetary fund remained, however, that its administration should be supervised by the International Civil Aviation Organization (ICAO).¹

The LACAC initiative was in response to the introduction of satellite technology to future air navigation systems which ICAO has been energetically involved in since 1993.² These new air navigation systems would be operated through a satellite network dedicated to the air transport industry. In order to ensure such an exclusive dedication to air transport users of a satellite system, the costs that have to be incurred would also be substantial. These costs that would enable the transition of air navigation from currently used navigation systems to satellite technology would have to be absorbed by a funding source in

order that an efficient and effective CNS/ATM system be implemented globally.

This paper will introduce the conceptual and practical evolution of the aeronautical monetary fund from its inception to date and analyze its legal and practical implications for the future of civil aviation.

Characteristics of the Fund

Eight members³ of LACAC presented its proposals for the aeronautical monetary fund to the aviation community during the 31st Session of the ICAO Assembly in September 1995. Citing the reason for the proposal as the difficulties faced by governments and airlines to obtain financing at reasonable costs for the modernization of airlines, airport infrastructure, air traffic services and navigation aids, LACAC introduced the proposal as a means to contribute to the balanced development of international air transport.⁴

The objective of the fund, according to LACAC, was to provide the financial resources necessary to meet the most pressing needs of LACAC member states for the construction and modernization of airport infrastructure, air traffic services and navigation aids. Also included in the list of beneficiaries were airline fleets which needed expansion and modernization.⁵

LACAC proposed that the fund be created through an international convention open to ICAO contracting states. The Convention would necessitate adherence by states if their airlines, airports and other initiatives were to benefit from the fund. The fund would be totally autonomous and politically independent from the control of individual or collective governments.

The money that formed the fund would come from the user — the airline — and any other interested financial institution and would be collected semi-annually in accordance with procedure agreed upon between the parties to the Convention.

It was also proposed that the fund be administered by a Board of Governors (one appointed by each member government), five Executive Directors elected by the Board and a Managing Director who should ideally be a senior member of the international banking community and elected by the Executive Directors. The administration of the fund included audit of accounts to be carried out annually by a specialized international firm of accountants. Inherent in the audit principles was a proposal for absolute transparency devoid of diplomatic immunity and commercial confidentiality.

The advantage of the fund was identified by LACAC primarily as self sufficiency. Other advantages were the improvement of air navigation facilities world wide by both the developed and developing world and the possibility of making available credit facilities through the fund to civil aviation bodies and the air transport industry.

Perhaps the most significant factor of the LACAC proposal is that the aeronautical monetary fund would act as a tool which would promote the implementation of ICAO's Strategic Action Plan.

The ICAO Strategic Action Plan (SAP), which was adopted by the ICAO Council on 7 February 1997, is primarily aimed at promoting the principles enshrined in the Chicago Convention⁶ in the most efficient manner so that the challenges posed by modern exigencies of civil aviation are met. The SAP would accomplish the following:

- a) Ensure that ICAO maintains its position as the main standard-setting body for international civil aviation;
- b) Encourage national ratification of instruments of international air law and implementation of ICAO Standards and Recommended Practices to the greatest extent possible so as to maintain a common aviation system world wide;
- c) Ensure that ICAO continues to focus on the exploration and development of aviation issues of a multilateral nature in the fields of legal, economic, and technical regulation and thereby remains a world forum for these issues;
- d) Identify priorities for ICAO and seeking to ensure that sufficient resources are made available to respond to the major challenges concerned; and
- e) Develop a continued efficient and cost-effective mechanism in ICAO for the management of technical cooperation activities.⁷

The issues that have been identified by ICAO for the triennium 1996–1998 as requiring the above action are:

- a) Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM)
- b) Airport and airspace congestion
- c) Commercial developments and economic regulation
- d) Financial resources
- e) Unlawful interference
- f) Human factors in flight safety
- g) Environmental protection
- h) Human resources
- i) Enhancement of ICAO Standards
- j) Safety oversight

The legal aspects of these issues form separate studies by themselves and have largely been addressed elsewhere.⁸ However, for the purposes of identifying a link between the aeronautical monetary fund and the primary areas of

importance for civil aviation as identified by the Strategic Action Plan, it is evident that CNS/ATM, airport and airspace congestion alleviation, and safety take a preeminent place in requiring financial resources for global implementation. Of primary relevance therefore are the legal issues that underline the justification of creating the fund and an overall legal analysis which would inquire whether the application of finances from an established aeronautical monetary fund to the above areas would be consistent with established ICAO policy.

Of course, it is an incontrovertible fact that the SAP cannot be implemented unilaterally by ICAO without the cooperation of its member states. Fundamentally, and from a legal standpoint, the position of ICAO in the international aviation community is not one that is compatible with being absolutely legislative in capacity. ICAO sets guidelines on civil aviation and facilitates the adoption of treaties and regulations, with the approval of its member states. It is then up to the member states themselves to implement them. The SAP is therefore essentially a two-sided issue and may be adequately subsumed by the adage "one cannot clap with one hand." The obligations of ICAO member states are paramount in giving teeth to ICAO's Standards and Recommended Practices and other guidelines, as much as in satisfying or otherwise accepting treaties of air law that they themselves have adopted under ICAO auspices.

It is therefore essential that ICAO contracting states recognize the compelling need to address the issue of the establishment of the aeronautical monetary fund in the context of its supportive role in financing on a global scale the key elements of the Strategic Action Plan of ICAO.

In the context of the above observations on the relevance of the fund to the implementation of the ICAO Strategic Action Plan, it is significant that the LACAC proposal called upon the ICAO Assembly to request the Council to establish a working group to study the need, appropriateness and usefulness of establishing an international aeronautical monetary fund for the above mentioned purposes.

Although the Executive Commission of the 31st ICAO Assembly, which considered the LACAC proposal, had great sympathy for the objectives of the proposal it was generally noted that the establishment of an international convention was both a complex and time consuming undertaking needing careful thought and detailed consideration of the issues involved before it attains fruition. While some members of the Commission recommended the consideration of more innovative financial instruments to realize funding for CNS/ATM, others, such as the observer for the International Air Transport Association (IATA - which is the association of commercial air carriers), strongly opposed the proposal on the grounds that it was inconsistent with ICAO policies to create a fund which was financed by users of civil aviation.⁹

The Commission concluded that the proposal for the creation of an international aeronautical monetary fund was laudable, and indeed, a valuable one but thought it fit to leave it to the ICAO Council to decide how best the proposal should be pursued further. The Commission recommended that the Council

should consider whether it would be appropriate to list the proposal as an item for discussion at the upcoming conference on the economics of CNS/ATM systems in Rio de Janeiro in May 1998.

Legal Issues

The main thrust of the proposal for the establishment of the aeronautical monetary fund was in the levy of an additional one U.S. dollar per every passenger ticket sold. Using this concept in the context of 1996, where the airlines of the 185 ICAO contracting states carried 1,380 million passengers,¹⁰ it is reasonable to assume that the fund would have generated at least 1,380 million U.S. dollars in the first year of its operations if it were established in 1996. The ICAO forecast that airline passenger traffic will grow at an average rate of 5 percent annually until 2003 means the fund will also grow larger by 5 percent annually in the foreseeable future.¹¹

At least one commentator has acknowledged the practical and political possibility of establishing an aeronautical monetary fund for the financing of the CNS/ATM system's implementation world wide. Saeed A. Al-Ghamdi, the Representative of Saudi Arabia on the Council of ICAO observes:

The precedents set by the joint financing agreements between Denmark and Iceland for the provision of air navigation services over the North Atlantic, and the existence of intergovernmental organizations such as the International Maritime Satellite Organization (Inmarsat), are examples of what international cooperation can accomplish when the political will exists. Similar cooperation is possible in the implementation of the CNS/ATM systems despite the massive size of the financial requirement.¹²

Mr. Al-Ghamdi lists numerous advantages of the proposed levy, some of which are the provision of unified satellite-based CNS coverage for air traffic movements in every region of the world based on ICAO's Standards and Recommended Practices; global adherence to safety criteria and regulatory parameters through world wide implementation of CNS/ATM systems; limitation of the financial burden imposed on users (airlines) due to the lack of adequate services around the world; meeting the rate of growth predicted for the air transport industry in the 21st century; and guaranteeing the implementation of the principles of the Chicago Convention and the promotion of harmonized global planning and implementation of the future air navigation systems.¹³

The most critical issues that have to be addressed in the assessment of the feasibility of establishing an aeronautical monetary fund are:

- 1) Whether the imposition of an additional levy on air transport users is inconsistent with already existing ICAO policy on charges; and
- 2) Whether the establishment of the fund is practical.

The seminal principle which mandates ICAO as the organization responsible for the international regulation of civil aviation is found in Article 44 (a) of the

Chicago Convention which requires the Organization to insure the safe and orderly growth of international civil aviation throughout the world. The word “insure” devolves upon ICAO the responsibility to make absolutely certain that international civil aviation grows safely and in an orderly manner. ICAO is also required, by Article 44(d), to meet the needs of the people of the world for safe, regular, efficient and economical air transport. Therefore, there is no room for doubt that the contracting states of ICAO, by the Chicago Convention itself, will hold ICAO accountable for ensuring safety and efficiency in air transport. In this context, even though ICAO has performed an admirable task in introducing a highly adequate CNS/ATM system for air navigation, it still has to make certain that these air navigation systems are implemented globally. Article 54(i) of the Chicago Convention authorizes the Council to request, collect, examine, and publish information relating to the advancement of air navigation and the operation of international air services, including information about the costs of operation and particulars of subsidies paid to airlines from public funds. This provision enables the ICAO Council to make an exhaustive study of the financial outlay needed for the 185 contracting states of ICAO to implement not only the CNS/ATM system but also related programs such as safety oversight which is often dependent on the availability of proper air navigation facilities and training in the States concerned.

The ICAO Council can also, by virtue of Article 69 of the Chicago Convention, intervene in instances where the Council believes that a state does not have adequate air navigation facilities and make recommendations for remedying the situation. Following this, a contracting state may conclude an arrangement with the Council for giving effect to such recommendations, as provided for by Article 70. More importantly, Article 71 of the Chicago Convention empowers the ICAO Council, at the request of a state, to provide, man, maintain, and administer the state’s air navigation facilities and airports for the safe, regular efficient and economical operation of air services of the other contracting states. Article 71 also empowers the Council to specify just and reasonable charges for the use of the facilities provided.

Article 77 of the Chicago Convention enables all the 185 contracting states of ICAO to form a joint air transport operating organization to pool their services on any routes or regions. The provision does not exclude the possibility of states pooling parts of revenue obtained from their air carriers’ services — such as an additional one U.S. dollar to be charged from each passenger of the pooled services — to be remitted to the joint air transport operating organization.

It is therefore clear that the Chicago Convention abundantly provides for the administration of air navigation services by the ICAO Council on a global scale, consequent to a detailed study of the cost implications of such administration. The Convention also provides for the pooling of air services for purposes of collecting revenue, which could be deposited in an international organization formed for that purpose.

The Joint Financing Paradigm

A regional analogy of financing of air navigation services which is administered by ICAO already exists in the nature of the joint financing agreements.

The operation of joint financing in civil aviation became necessary in the context of non-stop transatlantic flights North of the 45th Parallel, which is covered by the Flight Information Region (FIR) of Iceland. Air navigational facilities offered by Iceland are indispensable for aircraft flying within this region. Since major storm tracks converge very near Iceland and that area of the Atlantic around Iceland is favorable to the re-development of certain types of storms and to the formation of secondary depressions, it is generally during unfavorable meteorological conditions that the greatest number of aircraft operate in the vicinity of Iceland and traffic becomes congested, requiring full utilization of the air traffic control and flight information services offered by Iceland, such services were required to be given for the safe operation of international air services in the North Atlantic. At the North Atlantic Route Service Conference, held in Dublin in March 1946, a recommendation was made inter alia, that Iceland should provide an Area Control Centre in Reykjavik and certain telecommunications and meteorological services for the North Atlantic Region. These recommendations were approved subsequently by the PICAO¹⁴ Council on 17 April and 1946 and 9 May 1946.¹⁵ During the Conference, the delegation from Iceland made a statement to the effect that Iceland would not be able to provide the services recommended by the Conference, owing to the magnitude of aircraft crossings that required services. On 16 May 1947, as a follow-up to its statement, Iceland submitted to ICAO a request for financial and technical aid in regard to the air traffic control, communications, and meteorological services in Iceland in accordance with Chapter XV of the Chicago Convention. The ICAO Council, on 25 June 1947 concluded that the request of Iceland constituted prima facie grounds for aid to be rendered in the manner sought.¹⁶

Article 68 in Chapter XV of the Convention brings the joint financing concept into immediate focus, and extends the concept of sovereignty as enunciated in Article 1 by providing that each contracting State may designate the air route(s) to be followed within its territory by any international air service. If States have control over the designation of air routes over their own territories, it automatically follows that ICAO, which is charged by the Convention to develop the principles and techniques of air navigation¹⁷ and foster the planning and development of international air transport by inter alia encouraging the development of airways, airports and air navigation facilities for international civil aviation,¹⁸ should adopt measures to improve air navigation facilities world wide. The concept of joint financing is therefore a measure to improve air navigation facilities and airports throughout the world. As discussed earlier, the seminal provision that reflects the philosophy of the concept is seen in Article 70 of the Convention which provides that a contracting state may arrange with the ICAO Council to implement the Council's recommendations relating to the

improvement of air navigation facilities either by bearing all costs involved or by jointly financing such implementation process with the Council.¹⁹ A joint financing agreement between a contracting state and the ICAO Council is calculated to facilitate the use of land by the Council at reasonable terms,²⁰ provide technical assistance by the Council,²¹ and funding by the Council—all in pursuance of the objective of improving or developing air navigation facilities. Funding for a joint financing project is provided by the states whose airlines use the routes in question.²²

Another provision which is relevant to the establishment of the monetary fund is Article 75 which provides for the discharge of obligations by a contracting state under the joint financing agreement by taking over from the Council, its airports and other facilities that were handed over to the Council in pursuance of a joint financing agreement. The state may then pay the Council whatever monies that had been incurred in the development of air navigation in the territory of that state. The Council shall then return the funds to the states who paid them. This reimbursement is done on guidelines already set by the Convention.²³

States' obligations to provide air navigation services to the international community stem from Article 28 of the Convention, which provides that each contracting state undertakes to provide, in its territory, such facilities as airports, radio and meteorological services, and other air navigational facilities while adopting standards of communication and collaborating with a unified communications methodology.

The ICAO Assembly, by Assembly Resolution A1-65, established the general policy of ICAO relating to the joint support of air navigation services. The ensuing Joint Financing Agreement in 1948 has since been replaced by the Agreement of 1956²⁴ which has been amended by the Montreal Protocol of 1982.²⁵ This agreement requires Iceland to operate and maintain air navigation services without interruption²⁶ and provided for reimbursement of 95 percent of the costs to be made to Iceland by contracting states to the Agreement.²⁷

Assembly Resolution A14-37 made further provision in 1962 for increased participation by "user states" in joint financing agreements that were contemplated between the Council and the States involved. At its 16th Assembly in 1968, the ICAO Assembly issued guidelines for the implementation of economic aspects of joint financing agreements.²⁸ Since its inception, ICAO has held several conferences on joint financing : in Geneva, 8-26 June 1948 on the subject of Iceland; in London, 20 April-12 May 1949 on Greenland and the Faroes; and in Geneva 6-24 September 1956 for the revision of the Danish and Icelandic arrangements.

There are now 22 contracting states to the Icelandic Agreement and they reimburse 95 percent of the total costs of air navigation services under the agreement, which amounts to approximately \$15 million. Of this sum, user charges levied on airlines account for 80 percent of the total cost. ICAO's involvement

in the Joint Financing Agreement has been succinctly described by Gerald Fitzgerald :

Through its participation in joint financing schemes, contemplated by Chapter XV of the Chicago Convention, ICAO has made an important pioneering contribution by developing legal, consultative and administrative techniques to be used in the management of such schemes... The ICAO programme... was a great success in the North Atlantic area... through the use of innovative administrative and legal techniques, ICAO has demonstrated that it is possible to use the services of a neutral, inter-governmental organization for the administration of a complicated system of air navigation services required by the international community.²⁹

The joint financing agreements, and their successful implementation under ICAO's administration over the years, has amply demonstrated that, given the political will of States, it is practically impossible to establish and administer a fund which implements a global CNS/ATM system and other related areas of current importance to civil aviation.

Conclusion

It is important to consider the aeronautical monetary fund as a supplemental fund which would finance the installation and maintenance of the CNS/ATM systems and other related air navigational facilities and training related thereto in states which do not have the infrastructure and facilities. It would, of course, be established and used for a limited time, until the systems so funded can be maintained independently by states on a global scale.

The aeronautical monetary fund should be independent and mutually exclusive of charges levied by states for the provision of air navigation services. The basic principle underlying the philosophy of the additional levy should be consistent with the policy followed by ICAO as recommended by the Conference on Airport and Route Facility Management (Montreal, 29 October – 9 November 1991) that states should refrain from imposing charges for services and functions which are not associated with international civil aviation.³⁰

In order to ensure that the fund is made up of levies imposed equitably, it is advisable that those users whose states do not need financial assistance for the implementation of the CNS/ATM system are also charged the additional levy on their passenger tickets so that all airline passengers would contribute to the fund. In this context ICAO Council policy is clear. It states that providers of a service may require users to pay their share of the costs incurred on the basis that an equitable cost recovery system should take into account total air navigation costs incurred on behalf of aeronautical users and allocate such costs to categories of users.³¹

In practical application, this would mean that the additional levy for the aeronautical monetary fund should be charged on passengers who use the services provided on the basis that the costs incurred by the state concerned in providing the service has to be recovered. This policy, which would not discriminate

between users of developed states and states which need assistance, would prima facie give rise to a common aeronautical monetary fund. To ensure that the allocation of air navigation services costs among aeronautical users should be carried out in a manner equitable to all users, the ICAO Council could, under powers vested by Article 54 (i) of the Chicago Convention, acquire through states basic utilization data in respect of air navigation services, thus ensuring the equitable subscription of funds by a system of professional accounting.

The only difficulty with this methodology of levy is that airline passengers would be paying a sum of money (in addition to the usual user charges levied for air navigation services) beforehand, to fund a service in futuro, thus causing "prefunding." This impinges the basic "cost recovery" principle attached to ICAO policy on charges — that charges could be only levied to defray costs actually incurred — and would require a modality which could justify such a levy, on the basis of a definite identification of the benefits accrued to international civil aviation by the aeronautical monetary fund.

In order to circumvent the argument that the proposed aeronautical monetary fund, if funded purely for air navigation services rendered, would be inconsistent with existing ICAO policy, the funding mechanism may even be constructed on a general basis devoid of the connotation of charges for services rendered. If the levy on each passenger ticket could be implemented on the basis of creating a monetary fund which could be available to any applicant purely on the principle that monies of such a fund would be available for states to implement aviation policy in keeping with the SARPs of ICAO, the obstacle posed by the possible argument that the fund would be based on "pre-funding" for services in futuro could be obviated. With stronger reason, there is a compelling need at the present time to ensure aviation safety and an additional levy could easily be justified on that basis. Financial transactions conducted through the fund could be done along the lines of accepted international banking and interest policy.

The philosophy of the monetary fund could be based on the same postulate on which ICAO is run — i.e. that although States contributions to the sustenance of ICAO vary, the service provided by ICAO to all its member states is equal. As discussed earlier, the aeronautical monetary fund could exist only until needed, after which it could be disbursed on an equitable basis to be worked out by ICAO member states. The independence of the aeronautical monetary fund from any given objective such as the funding of CNS/ATM systems implementation or the implementation of safety oversight could even give the fund sufficient flexibility to supplement ICAO's budget in the implementation of ICAO's work program, when the need arises.

Any state may have access to financial support from the aeronautical monetary fund on a loan basis at a predetermined and common payment method based on interest. The ICAO Council, as administrator of the fund, could decide on the merits of each application for assistance. The collection of monies under the fund may be handled by a professional collector.

ENDNOTES

1. ICAO is the specialized agency of the United Nations responsible for the regulation of international civil aviation. It has a membership of 185 contracting states.
2. See R.I.R. Abeyratne, *Legal and Regulatory Issues in International Aviation*, Transnational Publishers: New York, 1996 at p. 261.
3. Argentina, Brazil, Columbia, Costa Rica, Cuba, Dominican Republic, El Salvador, and Panama, herinafter referred to as LACAC for ease of reference.
4. ICAO Assembly working Paper A31-WP/73, EX/26. App 2.
5. *Ibid.*
6. Convention on International Civil Aviation, opened for signature at Chicago on 7 December 1944, entered into force on 4 April 1947. ICAO Doc, 7300/6.
7. See ICAO Assembly Working Paper A29-WP/39 EX/8 APPENDIX at p. 8.
8. See R.I.R. Abeyratne, *Aircraft Engine Emissions and Noise, Environmental Policy and Law*, Vol. 24 No. 5, September 1994 pp. 238–250.
9. See A-31-WP/206. EX/87, 30/9/95 Corrigendum 2/10/95.
10. Annual Report of the council, 1996 (ICAO, Doc 9685) at p. 2.
11. See ICAO Projects Long Term Moderate Traffic Growth of 5 percent per year, a paper published by the ICAO Secretariat in ICAO Journal, December 1994 at p. 20.
12. Saeed A. Al Ghamdi, *Alternative Approach to Implementation of CNS/ATM systems Would Improve User Charge*, ICAO Journal, April 1993, p. 19 at 20.
13. *Ibid.*
14. Provisional International Civil Aviation Organization — the predecessor of the ICAO.
15. Report on the conference of Air Navigation Services in Iceland, Geneva, 8–26 June 1948, ICAO Doc 7000-JS/550, at p. 7.
16. *Id.* At 8.
17. *Id.* Article 44.
18. *Id.* Article 44 (C).
19. *Id.* Article 69.
20. *Id.* Article 72.
21. *Id.* Article 74.
22. *Id.* Article 73.
23. *Id.* Article 76.
24. Agreement on the Joint Financing of Certain Air Navigation Services in Iceland (1956), ICAO Doc 9586-JS/682.
25. *Ibid.*
26. *Id.* Article III (1).
27. *Id.* Article VII (1).
28. Assembly Resolution A16–10.
29. Gerald F. Fitzgerald, *ICAO and the Joint Financing of Certain Air Navigation Services* X11 *Annals Air and Space L.* 1987, 57, 59, 60.
30. Report on the Conference on Airport and Route Facility Management, ICAO Doc 9579 - CARFM (1991), Recommendation 2/24 at p. 38.
31. Statements by the Council to Contracting States on Charges for Airports and Air Navigation Services, Fifth Edition – 1997, Doc 9082/5, para 32–33 at p. 10.

INTERMODAL AIRPORT-TO-CITY-CENTER PASSENGER TRANSPORTATION AT THE 20 LARGEST U.S. AIR CARRIER AIRPORTS: THE PAST, PRESENT, AND FUTURE

Henry R. Lehrer

and

Aimee Freeman

Aviation Institute

University of Nebraska at Omaha, Omaha, NE.

ABSTRACT

The 20 largest U.S. air carrier airports handle close to 60 percent of all the passengers enplaned in the United States. While the intra-airport movement of these passengers has become more efficient in recent years, the most difficult and challenging airport-associated journey is still between the airport and the city-center. The root cause of this problem is likely due to the unexpected growth of air transportation following U.S. airline deregulation in 1978. Most major U.S. cities lacked a well-planned intermodal transportation infrastructure, particularly one that had an airport interface. Additionally, the automobile remains the predominant short-haul passenger transportation system in the United States (Nettey, 1995).

This paper presents an overview and analysis of the top 20 U.S. air carrier airports' efforts in the past, present, and in the future to provide intermodal passenger transportation between the airport and city-center. Airport planners, developers, and management personnel in the targeted cities were surveyed concerning these issues. These data will be used to extend the knowledge-base concerning development of the U.S. intermodal airport passenger transportation infrastructure.

INTRODUCTION

The growth of airlines as a transportation mode in the U.S. is well defined and of great importance. However, while the airports used by the certificated airlines have improved and are some of the busiest in the world, traveling between the airport and the local metropolitan area is still a difficult journey. Although the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 has focused attention on improved airport intermodal links, much work is still to be done (Transportation Research Board (TRB), 1993). Several factors make intermodal improvements and changes difficult. Airports (city/county/state public facili-

ties) serve airlines (private enterprise) and access to the airports is over transportation links funded heavily by the federal government. These three entities can at times be at cross-purposes and are all too often heavily snarled in legislative and bureaucratic red tape.

The purpose of this paper is to attempt to determine the current status of intermodal transportation links located at the busiest U.S. airports. One area of special interest is the ease of travel between the airport and the local metropolitan area (city-center) by means other than the automobile. Another focus of the research is to determine the perceptions of key airport officials concerning the planning, funding, and scope of such transportation links. The methodology for this study will include (a) a review of the U.S. airport system and enplanement statistics, (b) a survey of airport officials, and (c) an analysis of survey data.

U.S. Airport System

The U.S. airport system is well developed and consists of approximately 18,000 facilities with over 5,400 or 30 percent of these airports open to the public (Department of Transportation, 1995). Of those 5,400 plus public-use airports, 3,584 are included in the National Plan of Integrated Airport Systems (NPIAS). Airports in the NPIAS are further divided into four classifications (Wells, 1996). The four airport classifications are (number in each classification in parenthesis):

1. Primary (417)
2. Commercial Service (149)
3. Reliever (329)
4. General Aviation (2,424)

The focus of this paper is on Primary airports which are defined as those Commercial Service airports having more than 10,000 annual enplanements (FAA, 1991). More specifically, within those primary airports, the main thrust of this research centers on the 20 airports that enplane the highest number of airline passengers each year.

Intermodal Airport Infrastructures

A major component of this research study is an investigation of the use and integration of various passenger transportation modes at the airport interface. (Any reference to transportation from the city-center to the airport implies from the airport to the city-center as well). The term intermodal refers to transportation that combines two different modes such as rail and truck (Wood & Johnson, 1993). The Transportation Research Board (1993) further differentiates between intermodal and multimodal planning. Multimodal planning refers to system choices while intermodal planning emphasizes the most efficient way of moving from point to point through the system. When considering the context of

this research, however, the intermodal linkages are limited to the commercial airplane and the modes of transportation used to move passengers between the airport and the city-center. Specifically, this research study is interested in non-automobile types of transportation (particularly light rail, metro, dedicated bus line, and other high-occupancy-vehicles (HOV)) compared to automobile types of transportation (car, limousine, van). Landside transportation at U.S. airports has historically been dominated by the use of private automobiles. These vehicles carry on average only slightly more than one passenger per trip. The result is landside congestion. This congestion is compounded by families and friends that drive passengers to and from the airport thereby generating additional round trips. Another reason is that airport trips, especially for business travelers, frequently coincide with the hours when the roads are busy with other rush-hour traffic (Robart, 1995).

Continued reliance on non-HOVs in the airport environment as a primary transportation mode to and from the airport may in the future result in increased congestion. Of particular concern to airport planning and management personnel is increased congestion at the curbside. Indeed, curbside frontage has historically been one of the most congested areas at airports (Evans, 1995). Robart (1995) further stated that the need to balance airside and landside use of airports was clearly an issue. Reducing the landside congestion at airports requires expanding the availability and use of public ground transportation between the city-centers and their airports.

The use of multimodal or intermodal public transportation systems at U.S. airports has been somewhat slow in comparison to other parts of the world. In Europe, it is quite common to find easy access from the airport to the city-center by rapid and convenient rail or light rail service. At Amsterdam's Schipol Airport, transfer passengers that have at least four hours between flights are encouraged to secure a special exit visa, take the 20 minute train ride to Amsterdam, and enjoy the one-hour canal boat ride before returning to the airport for continuation of their journey. At London's Heathrow Airport, the underground trains of the Piccadilly line depart every five to nine minutes for the city. It seems evident that integration of the various modes of non-automobile mass public transportation has been a major thrust of these as well as other European airports' transportation planning efforts.

In the United States however, it sometimes appears that urban transportation planners in the past operated in a vacuum. Airports were designed and built by one group of people, highways by another agency, and other public transit systems by still another (Bremer, 1993). Such an operational methodology has not helped the airports to reduce their surface congestion problems or made it any easier for airport passengers to get to and from the airport by any means other than automobile. Thus integration is poor and the fragmentation is great (Nettey, 1995).

Compounding the problem of congested airport access is that not all passengers arriving at airports are transferring to another aircraft for the continuation of

their journey as most might believe. Historically, Denver's air travelers are roughly 55 percent hubbing (transfer) passengers and 45 percent origin-destination (O & D) passengers (Evans, 1995). This claim seems to be borne out when viewing Table 1. Although the data used by Hansen and Weidner are 1991 enplanement figures and all top 20 airports in the current sample population are not included, an average of over 55 percent of passengers are O & D. These O & D passengers generate the intermodal demand for both the outbound and destination legs of their trips.

Table 1
Percent of 1991 Origination and Destination (O & D) Enplanements at
Selected U.S. Airports

<i>Airport</i>	<i>Enplanements</i>	<i>O & D</i>	<i>Percent O & D</i>
Chicago O'Hare	29,040,932	11,078,080	38.15
Dallas/Fort Worth	22,625,338	12,101,410	53.49
Los Angeles	18,069,981	12,101,410	66.97
San Francisco	14,007,424	9,130,230	65.18
Newark	9,645,295	7,197,470	74.62
Detroit	9,470,549	4,801,450	50.70
Miami	9,212,517	4,609,900	50.04
New York LaGuardia	9,121,466	7,998,160	87.69
New York Kennedy	8,207,264	3,601,360	43.88
Houston	7,805,317	3,428,090	43.92
Average			55.43

Source: Hansen & Weidner, 1995, p. 10 & 11.

Airport Demographics

The airports that were included in this study were the 20 top facilities with respect to passenger enplanements as defined by the 1996 Aviation Capacity Enhancement Plan (FAA, 1996). An enplanement is defined as domestic, territorial, and international revenue passengers who board an aircraft in scheduled and non-scheduled service of aircraft in intrastate, interstate, and foreign commerce and includes in-transit passengers (passengers on board international flights that transit an airport in the U.S. for non-traffic purposes) (Department of Transportation, 1996). The top 20 U.S. airports in terms of total enplanements are listed in Table 2.

Table 2
Enplanements at Top 20 U.S. Airport as a Percentage of Enplanements at the Top 100 U.S. Airports

<i>Rank</i>	<i>Airport</i>	<i>Identifier</i>	<i>Enplanements</i>	<i>Percent</i>
1	Chicago O'Hare	ORD	30,549,625	5.85
2	Dallas/Fort Worth	DFW	25,514,422	4.88
3	Atlanta	ATL	25,364,630	4.86
4	Los Angeles	LAX	24,364,630	4.66
5	San Francisco	SFO	16,146,552	3.09
6	Denver	DEN	15,755,747	3.02
7	Miami	MIA	14,561,222	2.79
8	New York Kennedy	JFK	13,627,089	2.61
9	Newark	EWB	13,564,615	2.60
10	Detroit	DTW	12,666,331	2.42
11	Phoenix	PHX	12,397,443	2.37
12	Las Vegas	LAS	12,321,672	2.36
13	Boston	BOS	11,789,385	2.26
14	Honolulu	HNL	11,425,428	2.19
15	Minneapolis/St. Paul	MSP	11,410,274	2.18
16	St. Louis	STL	11,084,346	2.12
17	Orlando	MCO	10,531,965	2.02
18	New York LaGuardia	LGA	10,192,077	1.95
19	Seattle	SEA	10,138,818	1.94
20	Houston	IAH	10,118,565	1.94
Total			303,524,836	58.10
Top 100 Airports' Enplanements			522,376,979	

Source: FAA, 1996: The 1996 Aviation Capacity Enhancement Plan

RESEARCH QUESTIONS

The questions to be answered by this research study are:

1. How does the United States rank as a world leader in the use of non-automobile transportation systems for the movement of passengers from the airport to city-center?
2. How easy has it been for an originating or destination passenger to get from the airport to the city-center by some means other than the automobile?
3. Would the use of light rail/electric guide way or a similar system reduce curbside vehicular congestion at airports?
4. What is the priority for airport-to-city-center non-automobile transportation as viewed by airport managers in the survey and their local city/county planning unit?
5. Who should fund future airport-to-city-center non-automobile transportation modes?

SURVEY INSTRUMENTATION

The method of data collection selected for this research was an opinion survey. The subjects were airport management personnel at the top 20 U.S. airports based on the number of enplanements. Considered as management personnel that would have knowledge of the past, present, and future airport to city-center transportation methods and status were airport managers, directors of aviation, heads of transportation, landside directors of operations, or someone with a similar title or area of expertise at each respective airport. Individuals at each were selected as a result of telephone contact with the airport manager's/director's office. In many cases, that office referred the inquiry to another office that was more appropriate to provide the responding individual.

The survey instrument was a 13 question survey containing questions about (a) transportation from that airport to the city-center by non-automobile modes, (b) transportation planning issues, (c) use of light rail at airports, (d) local transportation emphasis, and (e) future funding responsibilities. A four-point Likert scale was used. The specific responses could be Strongly Disagree, Disagree, Agree, and Strongly Agree. The final survey was modified after a field-test with selected airports and knowledgeable aviation professionals.

The actual data collection was by telephone contact with the selected respondents. Each individual was told about the project and asked several demographics questions in addition to the specific survey questions. Each respondent was also told that all answers would be held in the strictest confidence.

DATA ANALYSIS AND DISCUSSION

In the following section, the data from selected survey questions are reviewed. In most cases, descriptive statistical methods are utilized; however, when a specific statistical test was performed, the Mini-Tab Statistical package was utilized. All tests were to the .05 level of significance.

U.S. Transportation Position

The use of city-center to airport non-automobile transportation is viewed with differing importance in various parts of the world. Meyer and Oster (1987) clearly outline the U.S. citizens' love of the automobile and the fact that reliance on that specific mode of transportation has inhibited the growth and utilization of advanced modes of public transportation. To establish a benchmark with respect to how the survey population evaluated the U.S.'s world leadership in intermodal transportation, the survey question stated, "This country is a world leader in the use of non-automobile transportation systems for movement of airport passengers between the airport and city-center." The responses to that question are contained in Table 3.

Table 3
U.S. is a World Leader in Non-Automobile Transportation

	<i>Strongly Disagree</i>		<i>Disagree</i>		<i>Agree</i>		<i>Strongly Agree</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Responses	1	(05)	14	(70)	5	(25)	0	(00)

Fifteen of the respondents or 75 percent disagreed or strongly disagreed that the U.S. is a world leader in the use of non-automobile transportation. This result tends to mirror the findings of the Transportation Research Board (1993) concerning the state of transportation planning and expansion, particularly intermodal, in the U.S. It seems that in the U.S., each transportation professional has a strong orientation toward that individual's specific area of expertise and not enough thought is given toward the intermodal concept. Although the ISTE made monumental strides toward development and enhancement of multimodal integration, the aviation segment of this legislation only calls for airport systems and master plans to establish planning links.

Airport Access Past/Present/Future

The importance of changing access to airports via non-automobile transportation modes in the context of past ease and current emphasis as well as future thrust was a part of several survey questions. The potential respondents were asked, "It was easy to get from the airport to the city center 10 years ago by a mode other than the automobile". Another question asked, "The movement of passengers between the airport and city-center is a high priority at my airport." The results of these two questions are contained in Table 4. The respondent from Denver was not included in Table 4 because that airport was not open ten years ago.

Table 4
Ease of Airport Access Ten Years Ago and Current Priority for Passenger Access

	<i>Strongly Disagree</i>		<i>Disagree</i>		<i>Agree</i>		<i>Strongly Agree</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Past	4	(21)	12	(63)	3	(16)	0	(00)
Current	0	(00)	2	(11)	8	(42)	9	(47)

Concerning access to airports by non-automobile modes in the past, only 16 percent agreed with the idea that access was easy ten years ago. However, 89 percent of the respondents indicated that current (and hopefully future) access to the airport by modes other than automobile was a high priority at their airport. A Chi-square analysis (1, N = 38) = 20.689, p .05, found that there was a significant

difference between the responses to these two questions. Thus it would appear that the subjects are aware that access has been difficult and that the priority for improving such access is high. However, an interesting variable in an airport's willingness to reduce automobile airport access is offered by FAA spokesman John Rodgers. Rodgers suggests that airport parking for private automobiles represents millions of dollars in additional revenues each year at major airports and this may influence the willingness of airport official to promote intermodal mass transit systems that reduce their parking revenues (TRB, 1993).

Light Rail Utilization

Light rail has several definitions (Department of Transportation, 1997; Harper, 1982; Wood and Johnson, 1993; and DeVore, 1983). However, a composite description of this mode of travel is a street car-type vehicle, often electrically-driven, with semi-exclusive or exclusive rights-of-way. The survey question for Table 5 was, "The use of light rail/electric guide-way or a similar system as a transportation mode to the airport is an excellent way to reduce curbside vehicular congestion."

Table 5
Light Rail Utilization to Reduce Curbside Congestion

	<i>Strongly Disagree</i>		<i>Disagree</i>		<i>Agree</i>		<i>Strongly Agree</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Responses	1	(05)	2	(10)	12	(60)	5	(25)

The respondents were strongly in favor of the use of light rail to reduce curbside congestion. 85 percent of those reporting agreed or strongly agreed with such implementation. During the data collection, several respondents commented that the amount of curbside available is not going to increase, dwell-time of vehicles seems to be increasing thus compounding the situation, and use of a mode such as light rail that moves arriving and departing ground passengers away from the curbside must be expanded.

Planning and Funding for Transportation Priorities

The question dealing with assigning responsibility for funding of transportation from the airport to the city-center consisted of three separate survey questions. They differed only in referencing which agency should be responsible for funding such that summarily, the question(s) stated, "Funding for future airport to city center transportation modes is the responsibility of (a) local, (b) state, or (c) the federal government." In the table below, the three differing responses are outlined.

Table 6
Funding Responsibility for Future Airport/City-Center Transportation

	<i>No Answer</i>		<i>Strongly Disagree</i>		<i>Disagree</i>		<i>Agree</i>		<i>Strongly Agree</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Local	4	(20)	1	(05)	3	(15)	11	(55)	1	(05)
State	2	(10)	0	(00)	5	(25)	12	(60)	1	(05)
Federal	2	(10)	0	(00)	3	(25)	13	(65)	2	(10)

From 60 to 75 percent of the respondents agreed that some governmental entity such as local, state, or federal government should have responsibility for future airport to city center transportation funding. However, which of the governmental units should have primary responsibility was not clearly identified. A Chi-square analysis ($4, N = 52$) = .6741, $p .05$, of the responses to these three questions found that there was no significant difference between the responses to the questions. It appears that some funding mechanism must be developed but the respondents appear to feel that the burden should be shared by several governmental units. There was a slight preference for federal funding with 75 percent of the respondents agreeing or strongly agreeing versus 60 percent agreement for local funding.

CONCLUSIONS

Several conclusions can be drawn from this survey of airport management and transportation officials at the top 20 U.S. airports. These conclusions are in the areas of (a) U.S. leadership in airport access by non-automobile modes, (b) past and current ease of airport access, (c) use of light rail, and (d) funding/planning responsibilities.

It was clear from the responses of the subjects to the survey that the U.S. is not a world leader in non-automobile airport access modes. Numerous respondents lamented the fact that the U.S. citizens' love for the automobile has been a barrier to the development and use of public transportation in this country. Several respondents pointed to European and Asian airports as models for intermodal transportation systems with strong airport interfaces. A frustrated transportation official at one of the largest airports summed up the issue with "nobody in this country seems to get it!"

Concerning the ease of traveling between the airport and the city-center, the respondents confirmed the experiences of seasoned airline travelers who know that such a journey is very difficult, frustrating, and usually quite expensive. However, several laudable systems (Atlanta, Chicago, and Washington, D.C.) are in place and operating well. Transportation officials at other airports not among these few exemplary situations were somewhat envious. The encouraging news though is that the issue of improving airport to city-center transit has a

high priority among governmental units as well as management and transportation officials.

Light rail appears to be seen as a viable (although rather expensive) solution to curbside congestion. The respondents strongly endorsed this mode of travel. One factor not determined by the survey was whether the respondents endorsed light rail as primarily as intra-airport or intermodal mode of travel. Several airports currently use light rail to move passengers to and from the terminal to parking lots and the JFK light rail system will connect terminals to parking areas and off-airport stations at Howard Beach and Jamaica (TRB, 1997a). The JFK system was in planning for 30 years. Additionally, the St. Louis Metrolink connecting Lambert-St. Louis International Airport with the city-center and points beyond in both Missouri and Illinois is operational and gaining strong local support (TRB, 1996).

The planning for future intermodal links is a high priority for both the subject airports and their local planning agencies. Since the advent of ISTEA, stronger and more diverse transportation partnerships are viewed more favorably for intermodal initiatives by potential funding sources. Furthermore, it seems imperative that any intermodal link to an airport must be part of a system in which the airport is not the sole beneficiary for such service. Considering funding of such projects, the current practice seems to be one of doing more with less (TRB, 1997b).

REFERENCES

- Bremer, K. (1993, March-April). Intermodalism — It's all coming together. *Airport Magazine* [online]. Available: <http://www.airportnet.org/depts/publicat/airmags/am3494/intermod.htm>
- Department of Transportation (1997). *Transportation expressions*. [On-line]. Available: <http://www.bts.gov/ggi-bin/btsprod/expr/expr.pl>
- Department of Transportation (1995). *National transportation statistics*. US Government Printing Office, Washington, DC.
- Devore, P. (1983). *Introduction to transportation*. Worcester, MA: Davis.
- Evans, G. (1995). The new Denver airport. In *Airports of Tomorrow* (TRB Publication No. 445, 6–12). Transportation Research Board, Washington, DC.
- Federal Aviation Administration (1991). *National Plan of Integrated Airport Systems (NPIAS) 1990–1999*. Washington, DC: Government Printing Office.
- Federal Aviation Administration (1996). *1996 aviation capacity enhancement plan*. [On-line]. Available: <http://asc-www.hq.faa.gov/96ACE.html>
- Hansen, M. & Weidner, T. (1995). Multiple airport systems in the United States: Current status and future projects. In *Airport and Air Transportation Issues* (TRB Publication No. 1506, pp. 8–17). Washington, DC: Transportation Research Board.
- Harper, D. (1982). *Transportation in America (2nd. ed.)*. Englewood Cliffs, NJ: Prentice-Hall.
- Meyer, J. R. , & Oster, C. V. Jr. (1987). *Deregulation and the future of intercity passenger travel*. Cambridge, MA: MIT Press.

- Nettey, I. R. (1995). *Enhanced integration of multimodal ground transportation with air transportation at selected major air carrier airports*. (NTIS No. SWUTC/95/60037-1). College Station, TX: Texas A&M University.
- Robart, C. (1995). Surface access to international airports. In *Airports of Tomorrow* (TRB Publication No. 445, 51–53). Washington, DC: Transportation Research Board.
- Transportation Research Board (1993). *ISTEA and intermodal planning: Concept, practice, vision. Proceedings of a Conference* (Special report 240). Washington, DC: National Academy Press.
- Transportation Research Board (1997a). Light rail to “The” airport. *LRT News*. Washington, DC: National Academy Press.
- Transportation Research Board (1997b). *National conference on setting an intermodal transportation research framework*. Washington, DC: National Academy Press.
- Transportation Research Board (1996). *National conference on intermodalism: Making it happen*. Washington, DC: National Academy Press.
- Wells, A. (1996). *Airport planning and management* (3rd. ed.). New York: McGraw-Hill.
- Wood, D. F., & Johnson, J. C. (1993). *Contemporary transportation* (4th. ed.). New York: Macmillan.

HUMAN FACTORS: TENERIFE REVISITED

**John McCreary
Michael Pollard
Kenneth Stevenson
and**

**Marc B. Wilson
University of Maryland Eastern Shore
Princess Anne, MD**

ABSTRACT

This case study is a human factors analysis of the aircraft collision which occurred at the Los Rodeos airport in Tenerife, on the Canary Islands. The collision between two 747 jumbo jets cost the lives of 583 people. This collision is an example of how large scale disasters result from errors made by people in crucial circumstances and illustrates the potentially devastating consequences of ineffective human and organizational behavior. This paper focuses on three areas that were the major contributing factors in the accident: stress, small group communication under stress, and small group dynamics. An analysis of the accident in each of these areas determined what measures can be taken to prevent catastrophes of this nature from reoccurring (reengineering for improvement).

INTRODUCTION

In March 1977, two 747 aircraft, one KLM and one Pan Am, both bound for Las Palmas in the Canary Islands, were temporarily diverted to Tenerife because the Las Palmas airport had been closed by a terrorist bomb explosion. The KLM flight landed at Tenerife first and its passengers were deplaned. The Pan Am flight landed 45 minutes later but its passengers remained on board. The airport at Las Palmas reopened 15 minutes later. The Pan Am aircraft was immediately ready to depart for Las Palmas but was parked behind the KLM and could not depart until the KLM aircraft taxied for takeoff. More than two hours passed before the KLM refueled, re-boarded the passengers, and was ready for takeoff.

Clouds and fog made visibility very poor, as low as 300 meters, so the controllers in the tower and the crews of both aircraft were completely dependent on their radios for information on runway positions. The tower instructed the KLM to taxi down the takeoff runway, turn around, and wait for further instructions. The Pan Am was to follow behind the KLM on the takeoff runway, turn off at taxiway C3, and use a parallel runway for the rest of its taxi. After completing its

turn around at the end of the runway, the KLM requested both takeoff and air traffic control's (ATC) clearance. The first officer of the KLM radioed, "The KLM 4805 is now ready for takeoff and we are awaiting our ATC clearance." The tower replied with the following ATC clearance, "KLM...you are cleared to line Papa Beacon, climb to..." While the KLM first officer was reading back the ATC clearance to the tower, the KLM captain released the brakes and said, "We gaan" (we go), and began the takeoff roll. After completing the ATC's read back, the first officer said either, "We are now —eh—taking off" or "We are now at takeoff." (The tapes of transmission were not clear.)

In a later statement, the tower controller said he understood the first officer's message to be, "We are at takeoff position." The controller replied in response, "Okay," then paused for two seconds and said, "Stand by for takeoff, I will call you." Meanwhile, in the Pan Am cockpit, the captain remarked that the KLM could possibly interpret the ATC clearance as takeoff clearance. So, immediately after the tower said "okay" and paused, the Pan Am first officer quickly responded, "We are still taxiing down the runway." This Pan Am message coincided with the end of the tower's instructions to the KLM to standby, which in the KLM cockpit caused a strong squeal. Both messages were barely intelligible in the KLM cockpit. The controller then told the Pan Am to report when clear of the runway and the Pan Am replied they would report when clear.

In the KLM cockpit, apparently only the flight engineer heard these last two messages leading to the following dialogue:

Engineer, "Is hij er neit af-dan?" (Is he not clear, then?)

Captain, "Wat zag je?" (What did you say?)

Engineer, "Is hij er niet af die Pan American?" (Is he not clear, that Pan American?)

Captain: "Jawal." (Yes)

The captain made this response quite emphatically. The planes collided about 13 seconds later.

Stress

Stress and its effect on human and organizational behavior are major factors in the Tenerife collision. According to Holroyd and Lazarus (1982) psychological stress involves "a judgement that environment and/or internal demands tax or exceed the individual's resources for managing them" (p. 22). Among the demands facing the KLM crew were delays caused by terrorists at their destination airport, difficult and uncertain weather conditions, and strictly enforced flight and duty time limits that were nearing expiration. The Pan Am crew faced the same environmental conditions and, although they were not near the limits of their duty time, they had been working for 11 hours and were being unnecessarily delayed by the KLM plane. The Spanish controllers in the tower were

dealing with much larger planes than usual and a heavier than normal traffic volume. In addition, the controllers were working in English, a less familiar second language. Demands such as these disrupt cognitive processes, decrease alertness and diminish judgement. George (1986, p. 542) outlined the following specific effects of stress on the performance of complex tasks:

1. Impaired attention and perception
 - a. Important aspects of the situation may escape scrutiny
 - b. Conflicting values and interest may be overlooked
 - c. Range of perceived alternatives is likely to narrow, but not necessarily to the best option
 - d. Search for relevant options tend to be dominated by past experience; the tendency to fall back on familiar solutions that have worked in the past, whether or not they are appropriate to present situations
2. Increased cognitive rigidity
 - a. Impaired ability to improvise; reduced creativity
 - b. Reduced receptivity to information that challenges existing beliefs
 - c. Increased stereotypic thinking
 - d. Reduced tolerance for ambiguity leading to cutoff of information search and premature decision
3. Shortened and narrowed perspective
 - a. Less attention to longer range considerations and consequences of actions
 - b. Less attention to side effects of options
4. Shifting the burden to the opponent (another)
 - a. Belief that one's options are quite limited
 - b. Belief that the opponent (another) has it within his power to prevent impending disaster

Many if not all of these effects were present at Tenerife. The KLM captain apparently did not even consider the possibility that the Pan Am was still on the runway. He cut off the ambiguity presented by the engineer and made a premature decision. He did not choose the better option of waiting a few more seconds versus taking off quickly.

Regression

Weick (1993) theorized that the key to understanding Tenerife may lie in the principle of stress causing regression to first learned responses. This means that in stressful situations, people regress or behave in ways or patterns they learned first. The KLM pilot had been an instructor for more than 10 years and had been flying routes again for only a short time. The significance of this is that in flight

simulation training, instructors act as controllers and issue takeoff instruction. Regression by the KLM pilot to the behavior patterns of an instructor would explain his taking off before the tower gave takeoff clearance. The KLM co-pilot and flight engineer may have been intimidated by the seniority and prestige of the captain and regressed to overly subordinate behavior by not raising the issue of the take off clearance and presence of the Pan Am more emphatically. Weick also observed possible regression on the part of the Pan Am pilot who wanted to stay off the active runway. Instead of trying to negotiate this with the Spanish controller, the Pan Am crew chose simply to follow the controller's instructions.

Performance

Research shows an inverted U-curve relationship between stress and performance (Hermann & Hermann, 1975 as referenced in 't Hart, Rosenthal, & Kouzim, 1993). Increasing stress to a certain point can lead to an increase in performance, but beyond that threshold point, increasing stress leads to diminished performance. Although the shape of the curve will vary from individual to individual and from task to task, this general curvilinear shape can be said to describe the effect of stress on individual performance in many situations. Research on groups, however, has shown a more linear relationship between stress and performance. In other words, effectively functioning groups perform better as stress increases.

Small Group Communication Under Stress

Communication problems in stress and crisis-prone, highly mechanistic groups are clearly evident twice in the Tenerife air disaster. First, during the KLM preparation for takeoff and even after releasing the brakes, the KLM co-pilot knew that the aircraft had not been given permission to take off by air traffic control. However, at no point does the co-pilot perform his duty to prevent the illegal takeoff. Second, although the KLM flight engineer had strong suspicions that the Pan Am jet was still taxiing on the active runway, he failed to make his suspicions clear to the captain.

These communications failings are not isolated incidents attributable solely to the flight officer's unwillingness to speak or act on these concerns. It is highly probable that, given the same group dynamics, even "perfect" flight officers would again follow the same behavior patterns. In fact, in January 1994, the U.S. National Transportation Safety Board (NTSB) report on the analysis of 37 major air transport disasters between 1978 and 1990 concluded that nearly 50 percent (17 of 37) accidents were caused by a failure of the first officer to properly monitor and challenge a captain's decision (Inside DOT & Transportation Week, 1994).

In a survey of organizational behavior (OB) studies on crisis decision making, 't Hart, et al. (1993) found that members of mechanistic group structures

work very well together until the group is forced to respond to an outside stress. During a crisis, three different communication patterns evolve:

1. Instead of the group's normal "bureaucratic prescripts of multi-layered and highly differentiated patterns of decision making", 't Hart et al. found that the patterns of decision making become *highly centralized*. In the case of the KLM airliner, the pilot responded to the stresses of time and weather by literally shutting all other players, including the ATC officers, out of his decisionmaking loop.
2. 't Hart et al. found that a profound form of Janis' groupthink hypothesis sets in during a crisis. "Criticism, dissent and mutual recrimination literally must wait until the crisis is over." Influenced by mechanistic-group behavior, the crew of the KLM airliner understood they had to be quiet and let the pilot, their sole decision maker, concentrate on decisionmaking. In fact, criticism of any form was either ignored or rejected by the KLM pilot. In a similar study focusing on group cognition, Schneider, Angelmar & Reinhold (1993) found (like Janis) that in certain types of task environments, different interpretations of the same events (seen as covert judgement) can generate similar overt behavior (group agreement).
3. 't Hart et al. found that inexperienced participants are often shut out of the centralized decisionmaking process. The principal players in the team will confer only with the most skillful, most trusted and most powerful co-players.

The inexperienced KLM co-pilot was on this first flight as a co-pilot. If the co-pilot had been seen as an equally experienced professional, the KLM captain may have included his views in the decision making process and taken his judgement into account. Lack of co-pilot experience is also cited by the NTSB in their previously mentioned 1994 study of major aircraft accidents. The median flying time of those co-pilots was 419 hours, or slightly less than three-quarters of a year's experience.

A linguistic analysis of the KLM co-pilot's conversations, as recorded on the aircraft's cockpit-voice recorder brings forth further data supporting the above hypothesis. The analysis found that the KLM co-pilot used "devices of mitigation" (such as phrasing statements as questions) and hedged statements with qualifications in order to soften the effects of his requests (Weick, 1993). Presumably knowing that his comments were out of line, the KLM co-pilot kept his suspicions to himself and when speaking used speech devices which were less likely to rile the captain.

Small Group Dynamics

French and Raven (1968) suggested that there are five bases of power: (1) reward, (2) coercive, (3) legitimate, (4) expert, and (5) referent. In the KLM case, the pilot certainly had expert power, a significant amount of legitimate

power, and vestiges of referent power. His referent power came from the fact that the pilot had recently given the co-pilot a check ride and could possibly do so again in the future.

Each person possesses certain characteristics or properties which carry value for other people. For example, a majority of our society may value wealth or material possessions while some people may place a greater value on personal characteristics such as friendliness or honesty. A powerful person is one who possesses one or more properties that are valued by others. Naturally, the greater amount of highly valued properties (in this case knowledge and experience) a group member has, the more potential influence the person may have over a group. In this incident, the KLM pilot exercised his expert power quite forcefully. The co-pilot and flight engineer yielded to the influence of the pilot despite the reservations each held. Neither one so much as even challenged the decision of the pilot. They undoubtedly behaved this way because of the established credibility of the KLM pilot and a desire to maintain group cohesion.

Cohesion

The more cohesive a group, the greater the influence the group may have on an individual. That is, the more cohesive the group, the more pressure can be brought to bear on an individual. In response, the individual may conform by changing original behaviors or attitudes or may reject group pressure by psychologically reinforcing an original position. In the latter case, one can expect greater rigidity and strength in the position as a means of defending it from outside pressures.

To summarize the group dynamics and the inflexible stance of the captain, the KLM crew was under stress not simply from a job performance perspective; they were very close to exceeding restrictions for flight duty as a crew. The captain had the job of taking care of his crew and himself. The co-pilot and flight engineer trusted the captain's judgement because of his experience level. It can be concluded from the interactions that took place in the cockpit of the KLM that the co-pilot and flight engineer chose to maintain group cohesion rather than challenge the captain. Their unwillingness to challenge the decision of a superior contributed to the Tenerife disaster.

Reengineering for Improvement

Instead of charting a path for improvement, the NTSB has recommended to the Federal Aviation Administration (FAA) that the FAA issue regulations to airlines that require captains to be receptive to challenges from co-pilots and further require that the co-pilots have sufficient experience to be able to challenge the captains (Inside DOT and Transportation Week, Jan 1994). It will most likely take a long time for these regulations to impact on the human factors which they are trying to address.

There are two improvement paths that the air transportation industry is pursuing: cockpit resource management training and improved technology. Both paths have been shown to lead to fewer human-factors related accidents, but both paths also choose not to alter the fundamental flaw - the cockpit crew's mechanistic group structure.

Crew Resource Management Training

It is currently assumed in the air transportation industry that training to overcome human-factors related failures, or crew resources management (CRM), will become a part of each airline's corporate culture. Currently, large airlines and aircraft manufacturers are slowly training each of their pilots.

Communication Training

Heine Caesar, manager of Lufthansa's operations inspections and safety division, told participants at the 1990 Flight Safety Foundation conference that "communication must be trained, especially in cultures where order and obedience are part of a normal daily life." Mr Caesar's recommendations included establishing precise crew coordination, promoting equal workloads and clear distribution of duties, and maintaining strict adherence to phraseology inside and outside the cockpit (Davis, 1990).

Stress Training

In addition to communication training, the air transport industry also promotes stress training as part of cockpit resource management. In 1988, a panel of experts, mostly psychologists from the American Psychological Association (APA), testified before the U.S. House of Representatives Committee on the Armed Services concerning the effects of stress on the military's mechanistic-structured groups. The panel testified that, although crews generally feel impervious to stress, if crews are made conscious of their vulnerability (through training) they can generally overcome the effects of stress. Specifically, the panel recommended that the military require that multiple people verify information and decisions to reduce the chance of error.

At about the same time the APA panel was testifying before the U.S. Congress, Aeromed, a Minneapolis-based company, added a new multimedia training kit to their "Medical Airworthiness" seminar series called "Aviation Stress Management." This series promised to help air crews realize the effects of stress in the cockpits, provided help in understanding the nature of human-stress response, and equipped air crews with stress management strategies.

Technology

Two different types of technological answers are available to the air transportation industry and each will yield significantly different results. First, airline manufacturers are investing heavily in cognitive science research to find effec-

tive human-systems interfaces that will allow machinery to better help humans think and solve problems. Second, however, is a technology that promises to change the management structure of the cockpit crew - remote cockpit management.

Remote Cockpit Management

Bernard Ziegler, Airbus Industries' senior vice-president of engineering and former chief pilot, reported in 1992 that communications technology is now advanced to the point that real-time digital data links of all aircraft data would be available to enable airlines to establish ground management sites to assist the captain and crew in routine and emergency aircraft management duties (Flight International, Sep 1992). The significance of this technology cannot be overstated. By introducing another layer of management (the ground control station), the pilot is thus removed from the rule of "boss" and becomes just another team player in a larger management system. Thus, the mechanistic flight dynamics, although still existent, are greatly mitigated in that the pilot will not be able to "override" ground control and is forced to maintain the bureaucratic, multi-layered decision-support system that is now most likely to be forgotten.

Conclusion

Aircraft crews are highly structured, mechanistic groups known to be capable of failures of communication and decision-making. The Tenerife air disaster is a clear example of that. Mechanistic groups typically perform very well as long as the tasks are fairly predictable and routine. However, during crisis situations, these trained responses tend to break down. Nowhere is this more evident than in the air transportation industry. Accidents due to equipment failures are now thought to constitute just three to five percent of all airline accidents. The remaining accidents are attributable solely to human error. Of the accidents attributed to human error, nearly three quarters of them are due to poor human communication.

The industry has recognized this problem for more than 20 years. The agenda for the 1974 Flight Safety Foundation and the 1975 International Air Transport Association meetings both identify human error as the "last frontier of aviation safety" and the industry has yet to conquer these problems. Just recently, the U.S. Federal Aviation Administration reported that more than 70 percent of the reports filed with the anonymous Air Safety Reporting System involve information transfer problems (Aviation Daily, 1990). In addition, authorities at the U.S. National Aeronautics and Space Administration's Ames Aerospace Human Factors Research Division also reports that up to 80 percent of all aircraft accidents are "due to a lack of adequate coordination or utilization of available resources (Cate, 1990).

Of course, statistics like these aren't very encouraging. We must continue looking for ways to reduce subjective decisions on the part of pilots. We can't

take the human factor out unless we want a system that is completely rigid and inflexible. Research, study of lessons learned, and application of the knowledge gained will help reduce the chances of another Tenerife disaster in the future.

REFERENCES

- Cate, B. (1990). Ames research center. *Aerospace America*. 10/1990, p.8.
- Davis, L. (1990). Complacency — A most dangerous state. *Air Transport World*. 3/1990, Vol 27, No 3, p. 128ff.
- FAA soon to unveil national plan for human factors research. *Aviation Daily*. 2/15/1990 Vol 299, No 33, p. 323.
- Flight crew involved air accidents linked to poor cockpit management. *Inside DOT & Transportation Week*. 1/21/1994, Vol 5, No 3.
- French, J. & Raven, P. (1968). In A. Zandler (Ed.) *The base of social power in group dynamics: Research and theory* (Ch. 20). New York: Harper & Row.
- George, A.L. (1986). The impact of crisis induced stress on decision making. In Soloman, F and Marstou, R (Eds.), *The medical implications of nuclear war*. Washington, DC: National Academy of Science Press. 529-552.
- Holroyd, K. & Lazarus, R. (1982). Stress, coping and somatic adaptation. In Goldberger, C. & Breznitz, S. (Eds.). *Handbook of stress*. New York Free Press, 21–25.
- Schneider, S., Angelmar, & Reinhard (1993). Cognition in organizational analysis: Who's minding the store? *Organizational studies*. 6/22/1993, Vol 14, No 3, p. 347ff.
- Squires, S (1988). The 'glass cockpit' syndrome: How high technology and information overloads contribute to fatal mistakes. *The Washington Post*. 10/11/1988; Health Section, p. Z7ff.
- 't Hart, P., Rosenthal, U., & Kouzmin, A. (1993). Crisis decision making: The centralization thesis revisited. *Administration & Society*. 5/1993, vol 25, No 1, p. 12ff.
- The captaincy question. *Flight International*. 9/23/1992.
- Weick, K. (1993). The vulnerable system: An analysis of the Tenerife air disaster. In Roberts, K. (Ed.) *New challenges to understanding organizations* p. 173–198. New York: Macmillan.

AVIATION/AEROSPACE TEACHER EDUCATION WORKSHOPS: PROGRAM DEVELOPMENT AND IMPLEMENTATION

Mavis F. Green
University of Illinois, Savoy, IL.

ABSTRACT

This proposal is for an Aviation/Aerospace Teacher Education Workshop. The workshop will be offered to elementary school teachers. During the course of the workshop, the teachers will become familiar with aviation fundamentals and issues, and with ways to incorporate aviation topics into their normal curricula to enhance education. The proposal is organized in two parts. Part I deals with issues of program development. These issues include program intent, benefit to the sponsoring institution, program model, credibility, co-sponsorship and potential problems. Part II deals with problems specifically related to program implementation.

Part I

PROGRAM DEVELOPMENT

Program Intent

The Aviation/Aerospace Teacher Education Workshop will be important to both the aviation and education communities. These workshops have been recommended by the Illinois Task force for Aviation/Space Education (1988) as a way of encouraging aeronautical education. The Task Force was sponsored by the Illinois State Board of Education and the Illinois Department of Transportation - Division of Aeronautics and was composed of a Blue Ribbon Task Force of professionals in both fields. The Task Force endorsed two initial premises:

“Great technological challenges are being met by a dynamic aerospace industry that requires the intellect and dedication of motivated young people and an understanding public. Aerospace touches the lives of every citizen, yet the awareness of career opportunities, the economic impact, the beneficial spin-offs are little understood by the average citizen” (p. ii).

and that

“The need for widespread aviation/space education in our schools and the public arena has never been more evident than today” (p. ii).

But the need is not only specifically for aviation education, but for science education in general. Newspaper and popular magazine articles constantly

bemoan the test scores of American students in the sciences when compared with other countries. According to Strickler (1980), trained educators see aerospace education as **basic education** and use aerospace as a motivating and meaningful medium through which they are able to teach the basic academic subjects. They take advantage of the interests that students have in aviation and space to teach such basic subjects as geography, English, mathematics, science, physical education, arts, business, etc.

The aviation community also has a great need to diversify—to encourage the participation of women and minorities. Currently, only an average of six percent of all pilots are women. Early exposure to the potential opportunities may help encourage future participation by this segment of society.

If there are so many advantages to aviation/space education, why is it not taught more in the schools? According to Marcec (1988), the regular classroom teacher looks at aviation/space as another technical science area in which they do not know the terminology and do not understand the concepts. Familiarizing teachers with the topic, and especially how it can be correlated with non-science subject, may increase their participation.

Sponsorship

A college or university is a logical sponsor of this workshop. Many institutes of higher learning have a threefold mandate which includes teaching, research, and public service. These workshops would certainly help meet the public service requirement. Boyle (1981) states that “Educational institutions should be responsible for facilitating the use of knowledge to serve the public” (p. 65).

Sponsorship of these workshops may also help and institution maintain support throughout its state for its other programs by showing that it is interested in promoting the general welfare of the state. An institution’s willingness and eagerness to help the Department of Education implement this recommended course in the furtherance of improved elementary education by providing sponsorship and making its facilities available may also help win political support in a time of budgetary constraints.

The facilities funded in conjunction with an aviation program are usually excellent for offering such a workshop. These may include air traffic control radar facilities, commercial air terminals, general aviation ramps, flight training facilities and training aircraft, flight simulators, computer aided aviation instruction classrooms, antique aircraft, and aircraft maintenance and restoration facilities. The ability to call on the professionals working in these facilities for input and participation is definitely an important asset. The overall experience for the teachers in being exposed to these facilities, and being able to participate in hands-on activities, will potentially leave a positive memory and elicit support and understanding for aviation.

The relationship that will be established with the teachers will also be important to the sponsoring institution in the long run. The teachers, when counseling their students, will hopefully mention this resource to them, thereby encourag-

ing a steady flow of students. As students become educated about aviation in their classes, even if they elect not to fly or pursue aviation as a career, they will at least be able to analyze issues dealing with aviation more knowledgeably. Hopefully, they will support aviation in a time when the industry appears to be under fire.

Program Model

There are a number of ways to discuss the model of program development suitable for this program. According to Boyle (1981) a model of program development is used as a rationale for selecting procedures. His institutional classification seems to apply to the type of program being proposed. "Many professionals, such as teachers...are required to earn a certain number of units per year to update their knowledge in their field. They enroll in courses or workshops designed to develop or improve their understanding of new information and research as well as techniques" (Boyle, p. 11). The objectives, which are developed from the knowledge within the discipline are, according to Boyle, often part of a larger problem-solving effort. In this case, the problems which need to be addressed include: increasing cultural diversity in technically-oriented fields, improving science skills in American students, and updating teacher competence and competitiveness.

The viewpoint to be used will have elements of the naturalistic as elucidated by Houle. Planning decisions will be made using practical contexts of action through a deliberative process in a specific context. Included, but not limiting, will be ideas from the Classical viewpoint of program development proposed by Tyler. The four questions posed by Tyler ask: what result does the program plan to obtain; through what type of educational experiences will these results be obtained; through what type of organization; and how will achievement be evaluated? The answers to these questions are all essential to a program. However, many other questions must also be answered.

The situation must be properly analyzed and the educational design chosen on this basis. Elements of Knowles and Donaldson seem especially important for consideration in development and utilization of experience. Teacher education must take into account the reality of the environment the teacher operates in and the individual teacher's expertise in this area. Failure to do so will definitely result in alienating this population. Respect for the experiences of the teachers is essential to the success of the program. Their participation in developing curricula ideas from the knowledge provided them, as a goal of the workshop, is also essential to its success.

Communication and relationship building, as espoused by Donaldson (1990) is also extremely important. The power to influence teachers and to gain continuing support for the program and for aviation in general, rests with the ability to build confidence in the sponsor's expertise and ability to understand the educator's workplace.

Potential Difficulties

Among the difficulties which might be encountered, gaining teacher participation looms paramount. A great deal of the incentive for teachers to enroll in the workshop must come from their ability to achieve continuing education units (CEU) that can be used to proceed toward an advanced degree or as a basis for fulfilling mandatory CEUs leading to an increase in salary. Educational institutions need to provide innovative ways for teachers to obtain these CEUs (Boyle). These credits must be offered to participating educators. The program will have potential economic benefit to the teachers and improve participation if, as a result of obtaining credits, they receive a raise.

Weekend and summer workshops have also become less attractive to teachers as salary constraints make it difficult to receive pay for participation. Ideally, a grant can be obtained to pay the teacher's full cost of enrollment as well as provide a stipend for participation. A NASA grant that stipulates a portion of the money be used to promote and support these Aviation/Aerospace Teacher Education Workshops is one potential source of funding. This program plan will be used as a basis for application for funding.

Program Credibility

Even if the above issues of credit and pay are addressed, teachers will not willingly waste their off-time on a program of little value to them. The program must have credibility to achieve enrollment. Association with an institution of higher learning automatically confers some credibility. However, additional credibility can be offered through the establishment of an advisory committee composed of co-sponsors and program developers.

Advisory Committee

It is essential that the prime representative on this committee act as a stimulator (Apps, p. 83) to "sell" the program to the other advisors and co-sponsors. The other roles he lists must also be filled—analyst, facilitator, and encourager. There must be someone to provide expert knowledge in at least two domains: (1) aviation subject matter and, (2) presentation of material to elementary school children. The program developer must also be able to establish linkages between the diverse groups involved in the program and establish comfortable working relationships based on mutual trust. The less pleasant role might be one of "nagger", ensuring all work is performed on schedule. Another name for this role, as suggested by Dahl, is administrator. The role of entrepreneur is also important. While ideally the costs of the program will be covered by grant money, the variety of support needed to make the program viable must be gained.

Teachers will be enrolling not simply for aviation knowledge, but for ideas on how they can use this knowledge in their classrooms. It is essential that an elementary school teacher be included in the program planning and activity development to ensure that the program remains relevant to the concerns of the

teachers. The teacher should also be involved with program implementation to provide insight into elementary training needs. Boyle (1981) feels that having client representation will speed up the process of change and reduce resistance to the program (p. 95). He also feels that those who are involved will aid in diffusing information about and legitimizing future programs.

The ability to offer course credit will be based on the ability to build faculty contacts willing to sponsor the program and also participate. Potential co-sponsors and advisory board members should ideally include appropriate departments such as Education or Engineering. The State Department of Education, State Division of Aeronautics, the FAA, NASA, and the Civil Air Patrol (CAP) are all organizations which actively promote Aviation/Aerospace Teacher Education Workshops and which lend support through planning aid and the provision of resources and speakers. Their participation would also lend additional credibility to the program.

An additional obstacle to the participation of the teachers might be their fear of being burdened with additional material they must now shoehorn into an already overcrowded schedule. It must be emphasized to them that the purpose of the workshop is to show how easily aviation topics and examples can be incorporated across their curricula to enhance education.

The Aviation/Aerospace Teacher Education Workshop will benefit both the sponsors and attendees. The big winners however, will be the students. They will have teachers better able to prepare them for the technological challenges they will encounter in the century to come.

Part II

PROGRAM IMPLEMENTATION

Part I addressed issues related to program development. Part II will address planning issues specifically critical to the implementation of an effective program. These issues include the solicitation of advice and program support, location and length of the program, learning objectives, learning activities, and program evaluation.

Advice and Support. There are many levels of support and advice that will be needed in ensuring an effective program. Caffarella (1988) talks about the need for support on the local, regional, state and community levels. Working within a university environment, this partially translates to support from within the sponsoring college. School systems within the host state, sponsors, and the trainees themselves must also be consulted. Munson (quoted in Caffarella) said that within these areas support must come from three major groups: top management, the immediate supervisors or potential training participants, and the trainees themselves.

Internal Support. Within the Aviation Department of the sponsoring institution, active involvement should be sought from the Director, Assistant Director, Head of Pilot Training, and the Chief Pilot. At a minimum, their support must be rendered in the form of authorizing release from normal duties for workshop organization. Optimally, however, their active involvement will enable utilization of their expertise for advice on implementation and scheduling. Their participation in events, possible acting as instructors or resource persons, and assisting with the awarding of certificates at the end of the program, will also add greatly to the credibility of the program.

It is essential that teachers receive graduate or CEU's for attending the workshop. The appropriate colleges within the university should be consulted for advice on obtaining this credit for teachers. Any requirements for classroom hours, curriculum content or instructor qualifications must be planned for in advance to insure against last minute surprises. Participants must be notified in advance of any credentials or other paperwork required for presentation at the workshop.

External Support. School principals and science program coordinators also need to be recruited for support of the program. By accepting the program as valid and offering in-house certification credit where appropriate, they may encourage attendance by their teachers. They may also be able to offer advice on developing curriculum ideas that will conform to any applicable state educational goals.

The support and advice of the trainees themselves is vital to the continuing success of the program. If any teachers are currently using aviation materials in their classes, they can be used as instructors or resource persons for a portion of the workshop. The success of future programs will depend on favorable word-of-mouth recommendations.

Advisory Committee. While an advisory committee is needed for program development, one is also needed for implementation. These two committees may be composed of the same, different, or additional members. Caffarella (1988) says that subject experts, process experts, organizational leaders, and consumers are types of people needed on an advisory committee. An appropriately staffed advisory committee can add a great deal of prestige and credibility to a program, making participation desirable.

Aviation experts can be provided from within the Aviation Department. The teachers, however, will be most concerned with how the material can be used effectively in their classrooms. An expert in elementary educational practice needs to be included in the planning process.

The process expert will be the program planner but may include others with similar functions within the institution such as Conference and Institutes.

Organizational leaders that may be consulted for advice include NASA, FAA, CAP, aviation professional organizations, and the state Department of

Transportation/Division of Aviation. These organizations may also be interested in sending speakers to participate in a portion of the workshop.

Last, but absolutely not least, is participation by the consumer. This involves the inclusion of an elementary school teacher on the advisory committee. The advice supplied by this individual can help insure that the program is addressing needs and supplying information of use and interest to the participants.

Program Location and Length. This Aviation/Aerospace Teacher Education program is proposed as a one-week resident program at the sponsoring university or college and will be limited to an enrollment of 25. University facilities are one of six types of commonly used facilities listed by Caffarella (1988) and seem to have clear advantages for this type of program. The setting will provide prestige and credibility for the program and allow it to be conducted in an atmosphere of serious intent and scholarship. Teachers are probably used to studying in this type of environment from their undergraduate education. This familiarity will hopefully lead to a frame of mind that will allow concentrated instruction to be effective. The one-week time frame for the course will allow enough class hours to be accumulated to qualify for one unit of CEU credit.

The resident aspect of the course will eliminate family distractions and allow the participants to concentrate fully on the material being presented. Participation by teachers from other parts of the state will be easier if a long nightly commute is eliminated. Some teachers may not find it possible to leave their families for that period of time while others will look forward to the break. Flexibility in arrangements can be allowed for and residency offered but left optional.

Arrangements can be made at dormitories for guest accommodations and meals. The dormitories are often within walking distance of classrooms where morning sessions can be held. The classrooms should be spacious enough to allow group projects to take place and be equipped with audio-visual equipment.

After lunch, a bus can depart from the housing facilities for an afternoon field trip. When returning to campus, the bus could make a number of stops at points of interest to drop off participants wishing to sightsee or shop. The participants can also spend free time in the afternoon and evenings at the library to prepare the written assignments required to obtain course credit.

Program Objectives

Houle states that any learning activity is a force field in which many other purposes than the professed goals are in operation. An explicit objective may be the professed goal—the intended result of a specific training activity (Caffarella, 1988). The other purposes may be thought of as implicit objectives. It is important for the program planner to be aware of both explicit and implicit objectives in order to design learning activities that will orchestrate between them and enable them to be met. There are three major categories of learning outcomes: (1) knowledge acquisition, (2) skill building, and (3) attitude change. Educational objectives focusing on the learners, are based on these possible out-

comes and are composed of three components—performance, conditions, and criterion (Cafarella, 1988).

Explicit Objectives. The explicit objectives of the workshop fall primarily in the knowledge and skill building domains. At the outcome of this workshop, the participants will be able to explain aviation fundamentals. They will be able to recognize the applicability of aerospace education across the curriculum and be able to prepare lesson plans that incorporate aviation themes. The participants will also be able to describe issues facing aviation today.

Implicit Objectives. The implicit objectives for the workshop seem to fall primarily into the attitude domain. One objective is for the participants to become advocates for aviation in general. The participants will accept and recognize aviation as a motivating and meaningful medium through which to teach basic academic subjects as well as technical material. They will endorse the use of aviation across their curriculum and select to use lesson plans incorporating aviation themes. Another implicit objective is to build good will toward the sponsoring institution(s).

Learning Activities

A variety of instructional techniques will be used to obtain the explicit and implicit objectives. This workshop will provide continuing professional education to elementary school teachers and must address preferred learning styles. Adults in general, according to Knowles, prefer a problem-based orientation. Teachers in particular want hands-on experiential learning experiences that have immediate and practical application in their classroom. A combination of lecture, guest lectures, simulations, video, demonstrations and hands-on projects, case studies, group projects, written assignments, and field trips will be used during the week-long course of the workshop.

A knowledge base does not need to be developed during each unit of instruction. This will be accomplished primarily through lectures, group projects, and demonstrations. It is extremely important that each lecture present not only subject content but suggestions for, and examples of, integration into a primary curriculum. Skill building will occur through case studies, hands-on projects, and written assignments. Attitude changes will occur through the interaction of all the designated learning activities (Cafarella, 1988).

Program Evaluation

It will be important to evaluate this program in a number of different ways. The overall value of the program and its ability to meet the stated objectives must be evaluated to determine if the program should be continued as is, modified, or discontinued. It is also important to evaluate each unit of instruction for effectiveness and relevance for the participants.

There is a danger in over evaluating, especially in terms of participant dissatisfaction. In terms of formative evaluation, two short evaluation cards could be provided to the teachers each day. One card could be at the classroom desks in the morning and collected as participants leave for lunch. The second card could be on the bus seats when returning from the afternoon field trip, filled out en route and collected when leaving the bus. Evaluation of specific program activities will be less reliable the farther removed in time from the actual learning experience and should therefore be done immediately following the session to be evaluated. The teachers may actually appreciate the fact that their opinions are being solicited. These evaluations may also aid in making timely changes in the format of following lectures to help ensure the success of the program.

Questions to be asked about the morning sessions concern content, speakers, teaching methods, and overall usefulness. Field trips can be evaluated in much the same way. These questions can be posed on a Likert-type scale, allowing the participants to agree or disagree along a continuum. Space should also be included for general comments from the participants. This may allow comments and suggestions not previously considered to be brought to the forefront. Teacher responses should not be unduly restrictive.

Summative evaluations to determine to what extent the course objective were met can occur through a questionnaire mailed to participants six months after course completion. This form can solicit information on how the teachers are using aviation in their classes, as well as their overall impression of the usefulness of the program to them and their students.

Summary

An Aviation/Aerospace Teacher Education Workshop has the potential to be a first-rate program. The content matter is solid, facilities excellent, and objectives worthwhile. From the moment the teachers are greeted by a student contingent to assist them with their check-in procedures, they will be able to make contacts with teachers of similar interests from around the state and will be given the time to build strong relationships. The good feelings they will leave with will hopefully translate into positive action in support of aviation.

REFERENCES

- Apps, J. (1979). *Problems in continuing education*. New York: McGraw-Hill.
- Bennett, N. & LeGrand, B. (1990). *Developing continuing professional education programs*. Urbana-Champaign: The Board of Trustees of the University of Illinois.
- Boyle, P. (1981). *Planning better programs*. New York: McGraw-Hill.
- Caffarella, R.S. (1988). *Program development and evaluation resource book for trainers*. New York: John Wiley & Sons.
- Donaldson, J. (1990). *Managing credit programs in higher continuing education*. Urbana-Champaign: The Board of Trustees of the University of Illinois.

Cervaro, R. M. & Wilson, A. L. (1991, May-June). Perspectives on program planning in adult education. *Proceedings of the Adult Education Research Annual Conference*, 32, pp. 39-48.

Houle, C. (1988). *The design of education*. Josey-Bass Publishers.

Illinois Task Force on Aviation/Space Education. (1988). *Report*. Springfield, IL: State Board of Education and DOT - Division of Aeronautics.

Lauffer, A. (1978). *Doing continuing education and staff development*. New York: McGraw-Hill.

AIR TRANSPORT LIBERALIZATION IN EUROPE: THE PROGRESS SO FAR

Peter Morrell
Cranfield University, UK

ABSTRACT

In April 1997, the final phase of a series of measures were implemented which were aimed at liberalising air transport within the European Union (EU). These measures were introduced on a phased basis, the first package coming into force in 1988, the second in 1990, and the most significant third package in 1993 (which included a delayed 1997 lifting of cabotage protection). These applied on a multilateral basis within the European Community (with some exclusion clauses), and followed progress towards liberalization on a bilateral basis between 1985 and 1988, most notably on routes between the UK and a number of EU countries.

This paper examines the progress so far in the achievement of liberalization and greater competition within Europe. It is based on extensive research carried out by the author and a team from Cranfield University over 1995 and 1996. This included desk research, a survey of and interviews with EU airlines and aviation authorities, and five more-detailed airline case studies. This has been updated by the author to take into account more recent developments, especially regarding new entrant airlines.

Some of the expectations following the introduction of EU liberalization have not been met: there have been few serious challenges to the flag carrier duopolies, there has been a consolidation of the major airlines in their home markets, and business and fully flexible fares have continued to climb. However, many of the airlines' strategic changes were more in response to developments in global rather than EU markets.

On the other hand, consumers have benefited from greater competition in promotional fares, and more dynamic pricing tactics overall have led to higher intra-EU traffic growth in the early 1990s than would have been the case without liberalization. There was also a substantial growth in the number of EU cities served by non-stop services, and some encouraging trends from new entrant airlines in some countries. On balance, it is argued that the net result has been disappointing; but this is hardly surprising given the timing of the final stage of liberalization in the middle of an economic recession, the concern of the larger airlines with more global events, and the time needed to change some of the more deep-seated structural barriers, such as airport slot availability, input market monopolies and state aids.

INTRODUCTION

The gradual liberalization of intra-community air services began when Europe's airlines were going through a profitable period (1983–1989), but the more fundamental changes arising from the second (effective November 1990) and especially the third (effective January 1993) liberalization packages

occurred at a time when economic recession and a downturn in demand growth pushed many airlines into deficit and several into a loss making spiral. Against that background, airlines would have taken a variety of actions to improve their worsening economic fortunes.

This paper considers recent research that has attempted to distinguish responses and actions which would have occurred anyway from those that arose directly as a result of the liberalization process and the Community liberalization. It thus seeks to draw some preliminary conclusions as to the success of the EU measures, particularly in its impact on scheduled services and competition, air fares, and air traffic. It will conclude with an examination of some of the barriers which still remain and which prevent moves to a more competitive industry. The scope of the analysis will be restricted to cross-border intra-European air services. Domestic services have thus been excluded. This is because these markets were only fully liberalized in April 1997, and because of the large variation in timing of national initiatives. Exciting domestic developments in Italy, Spain, France, and Germany will not be discussed, although changes in the last two countries will be mentioned in relation to cross-border investments by British Airways.

This paper is based on extensive research carried out by the author and a team from Cranfield University over 1995 and 1996. This included desk research, a survey of and interviews with EU airlines and aviation authorities, and five more detailed airline case studies. This has been updated by the author to take into account more recent developments, especially regarding new entrant airlines. Two other studies on European liberalization have also been widely consulted: the somewhat earlier reports from the UK's Civil Aviation Authority (CAA, 1993 and 1995), and the European Commission's own, less extensive, survey (European Commission, 1996).

There is clearly a considerable body of research that has examined the impact of deregulation on the U.S. domestic airline industry. Levine (1987) concluded that deregulation appeared to have resulted in a workable degree of competition in the system as a whole, and had brought very substantial benefits to the travelling public and airlines willing to adapt to it. An examination of the years immediately following U.S. deregulation concluded that airlines had used their pricing freedom selectively, with leisure passengers gaining from promotional discounts but business segments paying proportionately higher fares. Airlines increased average sector lengths, load factors, and aircraft utilization, and moved to higher density seating, but the authors attributed part of the reasons for these changes to sharply increased energy prices (Meyer et al, 1981).

However, the difference between U.S. and EU approach to liberalization was the more gradual EU introduction of measures. Perhaps more importantly, the expected impact of the liberalization on intra-EU scheduled air services was less than the U.S. First, the more self-contained nature of the U.S. market meant that deregulation applied to a large part of U.S. airline networks. In contrast, Figure 1 shows that European airlines such as Air France, British Airways and KLM

derive less than 50 percent of their revenues from intra-European air services. Distortions could arise from this significant external dimension, through the more favourable arrangements for some EU countries/carriers with third countries. Previous studies have argued that this is a justification for an increased role for the European Commission (Stasinopoulos, 1993). Furthermore, around one half of intra-EU air services, the charters, were already operating under extremely liberal rules and had been for many years.

Figure 1: The Importance of Intra-European Passenger Revenues for Major EU Airlines in 1992

Source: Author from Association of European Airlines' data

Australia also introduced deregulation of domestic markets in October 1990, and the early impact was similar to the U.S. in terms of higher business and lower leisure fares, although disappointing in terms of any serious and lasting challenge forthcoming to the existing airline duopoly (BTCE, 1995).

EU MEASURES FOR A SINGLE MARKET IN AIR TRANSPORT

Bilateral Liberalization

From the late 1970s through the 1980s the trend towards increasing liberalization of the airline industry spread from the domestic United States industry to international markets. Liberal bilateral agreements were signed in 1978 between the U.S. and various European countries (the Netherlands, Germany, Belgium) and in the following two years between the U.S. and various Asian countries (Thailand, Singapore, Korea). In Europe, the Netherlands and the UK effectively deregulated air transportation services between the two countries in

1984/85 with the adoption of an ultra-liberal bilateral and both countries subsequently endeavoured to sign relatively liberal agreements with other states in Europe. More liberal agreements were signed over the next three to four years between the UK and West Germany (1984), France (1985), Belgium and Switzerland (both 1985), and Ireland (1986). Such liberal bilaterals pre-dated the Community's first liberalization package of 1988 and, by going much further than this first package, had a more direct impact on air services between the countries concerned (Cranfield, 1997).

The impact of the bilateral liberalization of European air services has been analysed in a number of studies (see OECD, 1988 and Button & Swann, 1991). The OECD study suggested that air traffic on the UK/Netherlands routes was three to five percent higher as a result of the bilateral liberalization. The same study found that the effect on air fares was to increase the normal economy and business fares and to reduce significantly the lowest discount fare available. A recent study of UK/Ireland experience highlighted the increases in traffic and reduction of fares that bilateral changes produced, identifying new entrants airlines as the key to the achievement of gains from liberalization (Barrett, 1997).

European Community Measures

The creation of a single aviation market in Europe can be seen as a continuation of the liberalizing trend that had occurred bilaterally in the 1980s. The final move, which came into effect on 1 January 1993 with the so-called third package of measures, had been preceded by a number of developments at a European Community level. The first significant step dated back to the 1974 European Court of Justice ruling which judged that the Treaty of Rome's competition rules applied to air transport and the 1975 recommendation by the Commission for the establishment of a European market in aviation. The Commission's Memorandum 1 of 1979 (COM 79/311) called for a liberalization of the bilateral restrictions and a review of state subsidies. This led to the Inter-regional Directive, which introduced free access on inter-regional routes over 400 kilometres operated by aircraft smaller than 70 seats. This had little impact on air transport services in Europe as a whole. It was estimated that only 14 new services were started between regional airports, and many of these would probably have been allowed under existing bilaterals (Wheatcroft & Lipman, 1986).

The *Nouvelles Frontières* ruling of April 1984 ([1986] ECR 1425), the entering into force of the Single European Act and action by the Competition Directorate of the Commission against airline pooling agreements together provided the catalyst which led to the first package of December 1987. This package, and the second package of 1990, loosened the constraints of bilaterals between European Community Member States by freeing capacity limitations, allowing additional airlines to be designated and creating additional route rights.

The UK CAA study (1993) concluded that this first package allowed a number of smaller airlines to enter some of the most important intra-Community routes, offering the mix of capacity and fares that they wished. These included

existing airlines such as British Midland and Hamburg Airlines, and new entrants such as Air Europe and Ryanair. However, the initial 55:45 overall country-pair capacity limit was a constraint for UK airlines on French and Portuguese routes (although not Italy or Spain). A number of fifth freedom routes were started, notably by Aer Lingus via a Manchester hub, but some carriers thought that the 30 percent upper limit on the capacity offered to such traffic was too restrictive (CAA, 1993).

The second package allowed for some reduction in the thresholds for multiple designation, and a further loosening of capacity share restrictions. Route access was also significantly improved and a greater range of fares were subject to automatic approval.

These two packages left the fundamentals of the bilateral system in place. However, only those elements of individual bilaterals that were less restrictive than Community legislation were allowed to continue. In contrast, the third package of 1992 for the first time replaced the bilateral system with a multilateral system of air transport regulation. It established common rules for the award of an air operator's certificate, open access to air transport routes within the Community, and the freedom to set air fares and rates according to commercial criteria.

These rules moved away from the requirement of national ownership and control by creating the concept of a Community air carrier. They also removed the regulatory distinction between scheduled and charter airlines. These liberal rules open up traffic rights on all intra-Community routes for all Community air carriers (with full cabotage from April 1997), with a few exceptions, and remove capacity restrictions.

There was to be some protection for single carriers operating small aircraft on thin routes, and states could impose a public service obligation on scheduled air services to an airport serving a peripheral or development region in its territory, or a thin route to a regional airport of vital economic importance to a region.

DEVELOPMENTS IN SCHEDULED AIR SERVICES

Liberalization should benefit consumers through improvements in air services. These may be described in terms of increased choice of destinations served by non-stop flights, a greater number of flight frequencies on each route, and a greater choice of airlines.

The total number of non-stop cross-border routes served increased by 11 per-

in load factors and real yields over the worst part of the recession.

The average frequencies offered on all intra-EU routes increased from 13.9 departures per week in 1989 to 15.5 in 1992, subsequently declining to 14.5 in 1995. This indicates some frequency competition in the first period, with the decline since 1992 explained by the addition of new non-stop regional services (and some charters switching to scheduled) with below average frequencies, rather than by any reduction in frequency on the denser routes. This is evident from the sharp increase in number of routes served by only one carrier between June 1992 and 1995 (Table 1).

Average aircraft seat capacity did not change very much between 1989 and 1992, but increased between 1992 and 1995 on routes with competition from up to three carriers. Those routes with over three carriers competing were already served by larger aircraft, in part because of some fifth freedom operators with very large B747s. For these routes a decline in fifth freedom operators with large aircraft was compensated by an increase in average aircraft capacity from the third/fourth freedom airlines.

There is strong evidence that airline competition at the route level can only be effective if the number of actual competitors is greater than two (a good summary of work both in the U.S. and U.K. can be found in Dodgson, 1994). Competition is best captured by the number of effective competitors, rather than just the number of carriers serving the route. This takes into account the limited ability to compete of low frequency leisure or fifth freedom flights, the latter often serving the higher density routes in Europe. A capacity share index provides a good measure of effective competition, calculated by summing the squares of the shares (fractions or percentages) of seats provided by each airline on the route. Some studies have used the inverse of this index (based on shares expressed in fractions), which shows the number of effective competitors (Morrison & Winston, 1990). Figure 2 shows the trends in this number for key EU countries.

Figure 2 shows that there was an encouraging trend in the number of effective competitors between 1989 and 1992, especially in the countries of France, Belgium, and the UK. However, between 1992 and 1995, the trend was reversed in France and the UK, principally due to acquisitions by the flag carrier of the second largest airline in each country, and the failures of new entrants.

The European Commission's own study also concluded that competition has had little effect on routes run as a monopoly or duopoly, which represent 94 percent of intra-Community routes. Competitive developments had, however, occurred on routes with more than two carriers: these routes' share of total intra-EU routes had only increased from four percent in January 1992 to six percent in January 1996, but from 12 percent to 16 percent in terms of flights operated (European Commission, 1996).

The number of routes with sufficient origin destination traffic for new entrants is very limited in Europe, given both airport capacity constraints and surface transport competition (Pryke, 1991). Flag carriers such as KLM, and

Figure 2: Number of Effective Competitors on Services Generating 50% of Total Intra-EU Seats Offered, Summer 1989, 1992 and 1995

Source: Derived from Cranfield (1997)

their acolytes such as Air UK, are much better placed to develop new routes with feed traffic to and from their hubs. Competition between flag carriers has so far been limited, with little scope for competing on indirect routes within Europe, and only some attempts at direct attacks on others' national markets (e.g. British Airways with Lufthansa and Air France). Surface transport has up to now tended to provide competition for the less time sensitive leisure passengers, but high speed trains have a greater potential for doing so in the future for business travellers.

Established Carriers

Following European liberalization, established flag carriers moved to consolidate their position by share purchase of and alliances and franchising with smaller airlines. Together with the strengthening of their hubs through flight co-ordination, these changes might be seen either as defensive (i.e. to deter new entrants) in the intra-EU context. However, for carriers such as KLM and British Airways, they might also have been aimed more at improving their competitive position in long-haul markets. Between 1992 and 1994 the number of flights to/from hub airports rose by six percent, while those to non-hub airports declined by 19 percent (CAA, 1995).

The first and third packages gave EU airlines more opportunity to carry traffic both between two other EU countries (fifth freedom) and within another EU country (consecutive cabotage), both operated as an extension of a cross-border service from their home country. Considerable use was made of these freedoms

initially, especially by airlines based in peripheral EU countries, but many of these services were subsequently discontinued due to poor economics. An alternative way of serving routes out of other EU countries is available through the right to establish or acquire an airline based in another country. Airlines such as British Airways (TAT in France and Deutsche BA), Lufthansa (Lauda Air in Austria and others) and KLM (Air UK) have done so, but only on a minority basis, the maximum stake being 49.9 percent.

New Entrant Airlines

Excluding those airlines based outside the EU, there was a net increase of six in the number of airlines serving intra-EU cross-border scheduled routes between 1992 and 1995, compared to a net loss of four carriers between 1989 and 1992. The majority of these airlines served principally low density regional routes, although a small number of formerly charter airlines, such as EuroBelgian in Belgium and Air Liberté in France, started scheduled services in direct competition with national flag carriers. Competition has also increased significantly in French, Italian, and Spanish domestic markets as a result of EU liberalization, in some cases accompanied by allegedly predatory pricing from the former monopoly flag carrier.

The most notable survivors are Ryanair in Ireland, EasyJet and Debonair in the UK (although the latter with Italian shareholding), and Virgin Express in Belgium. Ryanair has been making steady inroads into the UK/Ireland scheduled market since the late 1980s, and now has 26 percent of the London-Dublin market. Following financial difficulties in the early 1990s and some intervention from the Irish government (CAA, 1995), it has recently sold a 25 percent stake in the airline to an American investor. Since acquiring an all B737-200 fleet its current strategy is to apply the U.S.'s Southwest concept to European markets using, where possible, secondary airports.

The success of EU measures to encourage new entrants is so far modest compared to the U.S., where around 15 percent of the domestic air travel market is offered by low cost, low fare new entrants (U.S. Department of Transportation, 1996). This sort of penetration has so far only been achieved in Europe on a small number of city pairs, with their current share of intra-European seat capacity less than two percent (McMullan, 1996). Their impact and influence in Europe, however, has been more significant than this figure would suggest.

In 1995, EuroBelgian accounted for 13 percent of the Brussels-Madrid scheduled market, 27 percent of Brussels-Barcelona, 20 percent of Brussels-Vienna, and 19 percent of Brussels-Rome, and only around three percent of Brussels-Milan (Flight International, 1996). It was acquired by Virgin Express in 1996, and the Vienna route was withdrawn. From 1997, the airline operated the Barcelona and Rome routes on a code sharing basis with Sabena, with the latter selling business and economy seats and Virgin selling only economy class.

This arrangement was also extended to Brussels-London Heathrow and Gatwick (using Sabena's slots). Virgin Express intend to add Nice and Copenhagen under their own code in 1997.

In the UK, EasyJet and Debonair took about 12 percent of the London-Barcelona market in 1996; EasyJet accounted for nine percent of the London-Nice market in the same year, and four percent of London-Amsterdam, while Debonair achieved only two percent of London-Munich. These shares were based on the start-ups operating for only five or six months of the year.

After building up a large share of the UK/Ireland market, the Dublin-based Ryanair established a subsidiary airline, Ryanair UK to compete on scheduled routes out of London Stansted airport. So far they serve only Dublin/Stansted, Dublin/Glasgow Prestwick and Prestwick/Stansted, but they plan to add Kerry and Stockholm in 1997.

Charter Airlines

European charter airlines were faced with a number of strategic options as a result of liberalization (Lobbenberg, 1995), such as going scheduled head-to-head with flag carriers; going scheduled on leisure routes; or staying with core charter business and developing long-haul.

Many airlines decided on the third options, particularly after the unfavourable earlier experiences of charters going scheduled. Some airlines, especially in Germany and the UK converted leisure charters into scheduled services. This was driven by the market requirements for some seat-only sales, greater control over their marketing, and, earlier on, the risk of losing slots at key airports. Those that tried to compete directly with flag carriers' scheduled services, earlier on under the loosening of bilateral restrictions, failed (e.g. Air Europe and Dan Air in the UK and Trans European in Belgium). A later failure was Air Liberté on Paris-London (subsequently acquired from the receiver by British Airways).

Those that were relatively successful either operated on a very limited number of routes (e.g., Maersk Air on Copenhagen-London, Transwede on Stockholm-London, Braathens on Oslo-London, Transavia on Amsterdam-London), or had strong flag carrier links (e.g., Lauda Air linked first to Lufthansa and later to Austrian Airlines, out of hubs at both Vienna and Milan), or a combination of the two (e.g., Transavia).

EuroBelgian Airlines had previously been a charter airline and began to compete successfully with Sabena on five routes out of Brussels. They were subsequently acquired by Virgin Express, and in 1997 joined forces with Sabena on two of these routes and others.

It must be concluded that, although charter airlines might have been considered as ideal low cost candidates to mount a serious challenge to the status quo, this does not now seem very likely to happen. This main reason for this is that they lack the right image and marketing experience, and the change in the nature of the service inevitably results in increased costs.

AIR FARE AND YIELD DEVELOPMENTS

The average revenue per RTK (yield) on air services within Europe has declined in real terms since 1991. This could have been due to a change in traffic mix to lower discount fares, the effects of the economic recession or an increase in the level of fare competition. The first factor certainly played a part over the first part of the 1990s. European airlines were better placed to offer price reductions in the first half of the 1990s, given the downward trend in unit costs, and in particular unit labor costs (Alamdari & Morrell, 1997)

Figure 3: Trends in European Promotional Fare Usage and Discounts

Source: Association of European Airlines' Yearbooks

The economic recession would have had the effect of reducing demand and causing overcapacity. The evidence above suggests that airlines increased the size of the fare discounts as well as the availability of these discounts, especially over the years 1991–1993. This reaction to overcapacity contrasted with behaviour over the previous recession. Figure 3 confirms this acceleration in the downward trend of European yields. Furthermore, a projection of the time trend of average fares between 1970 and 1989 suggested that the 1992 fares were four percent below trend, 1993 fares ten percent below trend, and 1994 13 percent below trend.

The European Commission also noted that the trend towards lower fares had not effected the most flexible fares, which had risen slightly, notably on routes operated by only one or two carriers (European Commission, 1996).

New entrants have introduced large reductions in fares on the limited number of routes that they served: EasyJet offered a one-way fare of Fl.99 on Amsterdam/London, compared to the lowest existing fare of Fl. 405 return. KLM retaliated with a Fl. 95 one-way offer, but EasyJet has complained to the European

Figure 4: Average Passenger Revenue per Passenger—European Routes

Commission that this fare is predatory. EasyJet started on their Luton/Nice route with one-way fares between £49 and £99, which caused one of the incumbent carriers, British Midland, to drop their lowest return fare from £159 to £99, albeit with travel restrictions. Ryanair entered the London-Glasgow market with a £59 return fare available across about 70 percent of total seat capacity, and a maximum of £99. The lowest previous return fare was £74 with conditions, or a fully flexible £236, but the two incumbents undercut Ryanair's fare by £1 prior to the launch of the new service. Ryanair have argued that the competing carriers' low £58 fare can only make a very small contribution to costs after paying the higher airport charges at London Heathrow and Glasgow Abbotsinch airports. They are more concerned, however, at the practise of such airlines making their low fare capacity dramatically more available than before (Jeans, 1995).

AIR TRAFFIC DEVELOPMENTS

Because it is difficult to obtain comprehensive data on the European charter and regional airlines on a consistent basis, the analysis of traffic trends to identify the impact of EU measures focuses on the larger scheduled airlines. AEA members' scheduled traffic within the geographical Europe region has grown strongly over the past few years in terms of passenger numbers. The European traffic of AEA members covers a somewhat broader geographical area than intra-Community, and excludes the smaller regional airlines and airlines such as British Midland (who have only recently joined the AEA).

In the past, traffic has been driven almost entirely by economic growth, the most commonly used measure of which is Gross Domestic Product, with a smaller contribution from yields since around 1987. In the early 1990s, Euro-

pean scheduled traffic has increased at a faster rate than would be expected from the past relationship between real GDP and traffic, which is given by the following equation calibrated on 1965-1990 data:

$$\begin{array}{rclcl} \text{Passengers (Number)} & = & -32,510 & + & 68,973 \text{ Real GDP (Index)} \\ & & (-19.0) & & (+38.3) \end{array}$$

Both the t-statistics were significant at the .05 level, and adjusted r^2 is 0.983. Forecasts of air traffic using 1990-94 actual European real GDP data can be seen in the next chart to fall well below the actual traffic outcome. Actual traffic exceeded forecasts by 8.2 million passengers in 1992 (+14 percent), 12.9 million in 1993 (+23 percent), and 14.6 million in 1994 (+25 percent).

One possible cause of the divergence is the early 1990s recession and its effect on traffic through overcapacity and lower air fares, rather than through GDP alone. A second model was therefore calibrated on 1965-79 data, and used to predict traffic over the previous 1980-84 recession. For this model, real GDP variation again explained almost all traffic variation (adjusted r^2 was 0.995 and significant t-statistics); it also provided reasonably accurate forecasts of traffic over the 1980-84 recession period, contrary to the 1990-94 situation.

Over the previous recession European airlines managed to maintain real yields by limiting capacity increases, but over the latest recession capacity has not been restrained and real yields have had to fall to maintain seat factors. Overcapacity was also more serious in the early 1990s with AEA carriers increasing available seat-km's by 12 percent between 1991 and 1992, six percent in 1993 and five percent in 1994.

This compares with broadly unchanged capacity offered by AEA carriers over the years 1981, 1982 and 1983, and only a two percent increase in 1984. Over both periods seat factors have been maintained at between 57 percent and 60 percent, and even increased somewhat overall in the 1990s recession (leaving aside the sharp fall immediately following the Gulf War).

The question still remains as to how far EU measures and increased intra-EU competition might have influenced this complex mixture of traffic, capacity, yield and load factor. Real yield has become a significant determinant of passengers travelling within Europe, and this is reflected in a model calibrated on 1980 to 1994 data (yield was not a significant explanatory variable in regression models calibrated on periods ending before 1990):

$$\begin{array}{rclcl} \text{Log (Passengers)} & = & 14.222 & + & 1.948 \text{ log(real GDP)} & - & 0.754 \text{ log(real Yield)} \\ & & (+24.1) & & (+20.2) & & (-6.4) \end{array}$$

All t-statistics (shown in brackets below the equation) are significant, and the adjusted R^2 is 0.990. The Durbin-Watson statistic is 1.56, from which it can be concluded that, at the 99 percent level of confidence, serial correlation was not present. This suggests that almost all passenger variations were explained by variations in real GDP and real yield. Frequency competition is likely to have

Figure 5: AEA European Air Passengers—Actual vs Predicted

1. 1980 to 1984 Economic Recession

Source: Cranfield (1997)

2. 1990 to 1994 Economic Recession

Source: Cranfield (1997)

had little effect on the overall market size, but would have been used to increase market shares of individual carriers.

Attempts were also made to insert a competition or liberalization dummy variable into the equation from 1989 onwards, with poor results. This was hardly surprising given the gradual introduction of liberalization within Europe, starting as early as 1985 for some country pairs.

The analysis of air fares in the previous section suggested that levels have risen overall with some increase in the availability of deeper discount fares. It can thus be concluded that lower yields overall in real terms (unchanged or somewhat lower in current prices) was caused largely by a change in the mix of traffic in favor of passengers travelling on promotional and discount fares; it is this that has appeared to have played a very much stronger role in generating traffic over the early 1990s, compared to the previous recession. The available evidence suggests that this came about through:

- Premium traffic (club and full economy fare passengers) trading down to lower available fares, possibly accepting some booking or travel time restrictions,
- More seats being available at the lower economy and discount fares.

The first effect above was the result of the general business climate, and was not dependent on the degree of competition in EU air transport. The second, however, would indicate a more competitive response by airlines, only insofar that airlines were actively promoting these lower fares to maximise revenues and raise load factors, rather than merely reacting to altered booking patterns and the external economic environment. It is also possible that the more liberal regime covering fare filing and tariff approval from 1989 onwards made it easier to offer tactical discounts to generate additional demand. Furthermore, revenue pooling agreements were gradually dismantled from 1988 onwards, thus allowing for greater fare competition on intra-EU routes.

REMAINING BARRIERS

There are still some very significant barriers to entry in intra-EU markets; they can be categorized as:

- Administrative
- Infrastructure capacity constraints
- Imperfect or monopolies in input markets
- Economies of scale

The first category relates to administrative obstacles that prevailed in certain countries and prevented the full implementation of the three packages. Many of these have now been solved, such as the reluctance of the French government to

open up Orly airport to competitive air services in 1994. Other examples concerned resistance to an application by Lufthansa to operate consecutive cabotage (Italy) and Greek delays in processing applications for operating licenses (Cranfield, 1997). State aids to national airlines might also be included under the first barrier, providing both barriers to entry and a distortion of the marketplace. Airlines receiving state aids have been accused of unfair pricing on some routes, and entry opportunities have been limited because they have continued to operate unprofitable services (and monopolized scarce slots).

The second category relates to the airport slot problem, and to a lesser extent air traffic control capacity bottlenecks. This is more difficult to solve, given growing environmental opposition even to existing flights. Niche carriers have made use of secondary airports such as Luton (for London), Prestwick (for Glasgow), Charleroi (for Brussels), Mönchengladbach (for Düsseldorf) and Beauvais (for Paris).

Monopolies in input markets significantly increase the cost of new entrant operations. A prime example is ground handling, but government supply of airport and ATC services also come into this category. The first should improve, albeit slowly, as a result of the new EU directive, but this could be slow and subject to lengthy court cases. The second can only be avoided again by using secondary airports which are to some degree competitive with the major capital city hubs.

Economies of scale depend on the nature of the industry, and might require some legislation to promote a more competitive industry. Examples of this are distribution channels, which tend to be dominated by large carriers, and frequent flyer programs that confer advantages of size on large airlines.

Figure 6 ranks the remaining barriers according to industry expert views on their relative importance. Some, such as FFPs or agent override commissions, do not constitute a formidable barrier by themselves, but taken together do.

Some observers have also cited lack of finance as a barrier to entry, based on their estimate of the minimum scale required to compete successfully, and relatively poor record of industry profits (Powell, 1994). The committee set up by the European Commission to reflect on the future of aviation in Europe recommended that access to financial markets would be helped by easing the restrictions resulting from the effective ownership and control requirements found in most Air Services Agreements (Comité des Sages, 1994). Another study for the European Commission mentioned operating leases as a source of finance for second tier airlines, with bank finance generally restricted to good name airlines (Jet Finance SA, 1995). Some new entrants with sound business plans have clearly failed to get started through their inability to meet EU financial fitness criteria, but others have been funded by large industrial groups (e.g., Virgin Express and EasyJet).

Figure 6: Importance of Various Barriers to Entry

Source: Interviews with European airlines and aviation authorities in Cranfield (1997)

† Reluctance of some states to enforce EU measures

CONCLUSIONS

Because of Europe's geography and distribution of population and wealth, a limited number of routes of sufficient density are available to potential new entrant airlines. Those with potential are characterised by having airports at at least one end of the route which are:

- Increasingly dominated by flag carriers and alliance groups;
- Slot constrained; or
- Expensive to operate at because of little competition in input markets.

Some hope remains for indirect competition using secondary airports. Direct flag carrier competition at major hubs outside their own country is becoming increasingly difficult. The problems encountered by British Airways in competing using local carriers in France and Germany (and also Lufthansa in the UK and Austria) may discourage further such developments.

The overall impact of liberalization on air fares has been more positive in terms of the availability and size of discounts offered. This can be observed from the introduction of the first package onwards, and these lower fares are estimated to have generated almost 12 million more (+ 20 percent) passengers a

year on average between 1992 and 1994 than predicted. Fully flexible fares, however, have remained immune to any widespread discounting, with only British Midland offering premium class travel in Europe at lower fares. It is estimated that air fares were on average a little more than ten percent below the levels that they would have been without liberalization.

It is difficult to see new entrants providing any serious threat to fully flexible and business class fares, given the constraints outlined above. It is more likely that, as flexible/discount fare differentials widen, airlines will find it increasingly difficult to enforce the restrictions attached to some of the promotional fares. Reductions in flexible fares will be obtained by larger purchasers of business travel and agents will obtain similar reductions on behalf of lower volume customers. High speed rail will also increasingly provide competitive services and fares for business passengers between many major cities.

REFERENCES

- Alamdari, F. & Morrell, P. (1997). Airline labour cost reduction: post-liberalization experience in the U.S. and Europe, *Journal of Air Transport Management*, Vol. 3, No.2
- Barrett, S. (1997). The implications of the Ireland-UK airline deregulation for an EU internal market. *Journal of Air Transport Management*, Vol.3 No.2, June
- Bureau of Transport and Communications Economics (BTCE) (1995). Deregulation of domestic aviation in Australia, 1990–1995, Information Sheet 6
- Button, K. & Swann, D. (1991). Aviation policy in Europe. *Airline deregulation international experiences*, Button, K., & Fulton, D. (Eds.). London
- CAA (1993). Airline competition in the single European market, CAP 623, Civil Aviation Authority, UK, November
- CAA (1995). The single European aviation market—Progress so far. CAP 654, Civil Aviation Authority, UK, September
- Comité des Sages (1994). Expanding horizons: civil aviation in Europe, an action programme for the future. A report for the European Commission, Brussels, January
- Cranfield (1997). Single Market Review: Impact on Services—Air Transport. Published by Kogan Page, London, on behalf of the European Commission
- Dodgson, J. S. (1994). Competitive policy and the liberalization of European aviation. *Transportation*, 21
- European Commission (1996). Impact of the third package of air transport liberalization measures, COM(96) 514 final
- Flight International* (1996). Virgin Express builds on EBA's success, 19–25 June, p.16
- Jeans, T. (1995). Barriers to entry—the Ryanair experience. Paper presented at a conference entitled Europe's New Wave: Barriers to Entry. Avmark International, 11 December
- Jet Finance SA (1995). Analysis of the comparative ability of the European airline industry to finance investments. Report for the European Commission, June

- Levine, M. E. (1987). Airline competition in deregulated markets: theory, firm strategy and public policy. *Yale Journal on Regulation*, Vol.4 No.2
- Lobbenberg, A. (1995). Strategic responses of charter airlines to single market intergration. *Journal of Air Transport Management*, Vol.2 No.2, June
- McMullan, K. (1996). European challenge: making waves. *Air Transport Progress* 1997, Lookturn, December
- Meyer, J. R., Oster, C. V., Morgan, I. P., Berman, B., & Strassmann, D. (1981). *Airline deregulation: the early experience*. Auburn House
- Morrison, S. & Winston, C. (1990). The dynamics of airline pricing and competition. *American Economic Review: Papers and Proceedings* 80
- Powell, C. (1994). Financial barriers to market entry. Open Forum. *Journal of Air Transport Management*, Vol. 1 No.3, September
- Pryke, R. (1991). American deregulation and European liberalization. Bannister and Button (Eds) *Transport in a free market economy*. Macmillan
- OECD (1988). *Deregulation and Airline Competition*. Paris
- Stasinopoulos, D. (1993). The third phase of liberalization in community aviation and the need for supplementary measures. *Journal of Transport Economics & Policy*, Vol. XXVII No.3, September
- U.S. Department of Transportation (1996). The low cost airline service revolution, April
- Wheatcroft, S. & Lipman, G. (1986). Air transport in a competitive European market. EIU Special Report No. 1060

TOWARD AN INTERNATIONAL OPEN SKIES REGIME: ADVANCES, IMPEDIMENTS, AND IMPACTS

Rex S. Toh
Seattle University, Seattle, WA

ABSTRACT

The International Air Transportation Competition Act of 1979 heralded the era of Open Skies in international aviation. This paper traces the post-war regulation and then deregulation of fares, rates, routes, and capacity all the way from Bermuda I through the partial dismantling of the International Air Transport Association (IATA) price fixing apparatus; and discusses the impediments to Open Skies and examines the impact on the IATA.

THE POST WORLD WAR II ERA OF REGULATION

Following the 1944 collapse of the Chicago Conference, the United States and Britain signed the precedent-setting Bermuda I Agreement in 1946. Bermuda I granted each party the five freedoms of the air¹ on named routes and for approved multiple carriers without capacity or flight frequency restrictions (but which could be imposed ex-post facto). The Agreement clearly favored the United States which then accounted for about 60 percent of the world's passenger airline traffic and which had the largest and most efficient international airlines. As a concession to the British who feared American domination, the Americans agreed to allow the International Air Transport Association (IATA) to set international fares and cargo rates and severely limit fifth freedom rights. Bermuda I served as the model for future bilateral aviation agreements between countries, making IATA a virtual fare-setting cartel. But in subsequent bilateral agreements not involving the United States, capacity and flight frequency was determined ex-ante with an attempt to evenly split the traffic between the carriers of the two countries, often involving pooling agreements to evenly share the revenues.²

Thirty years later, in 1976, the British gave notice of termination of Bermuda I, claiming that under the terms of the treaty the American carriers had a disproportionate share of the traffic. Fearing a complete breakdown of commercial air activity with Britain, the United States was forced to sign Bermuda II in 1977, capitulating to British demands to virtually eliminate multiple carrier designations, limit the capacity offered, and relinquish some of the American fifth free-

dom rights to carry traffic between Britain and other countries. Bermuda II was a devastating policy setback for the United States which had always advocated a freely competitive market structure.

On the other hand, in the same year in 1977, Freddy Laker launched Laker Airways, a charter service that lowered fares on the North Atlantic blue ribbon route. In the meantime, non-IATA air carriers from developing countries, particularly in Southeast Asia, were heavily discounting fares by as much as 50 percent,³ causing illegal discounting of IATA fares through extra commissions to travel agents by the association's own members.

The Push for Open Skies

In 1978, the United States orchestrated three events to show the international aviation community that her concessions in Bermuda II did not signal a policy change and that she was firmly committed to a pro-competitive negotiation policy.

First, in early 1978, the United State issued a statement entitled, "Policy for the Conduct of International Air Transportation", which proclaimed that America will endeavor to "trade competitive opportunities, rather than restrictions...and pursue our interests in expanded air transportation and reduced prices."⁴ At the same time, U.S. Department of Transportation officials made clear that the new policy directives signaled the denunciation of Bermuda II.

Second, in the same year, the Civil Aeronautics Board (CAB) issued an order directing the IATA to show cause as to why the CAB should not rule that its international tariff agreements are no longer in the public interest and therefore should be disapproved.⁵

Third, towards the end of 1978, Congress passed the Airline Deregulation Act which deregulated domestic airline transportation and provided for the eventual demise of the CAB at the end of 1984. This clearly set the stage for an Open Skies policy to be pursued internationally.

Soon after, the International Air Transportation Competition Act (IATCA) of 1979 was passed promulgating, among other things, three categories of goals.

- **Category I:** Multiple carrier designations or traffic rights for American air carriers with permissive route authority and without operational restrictions with respect to capacity and flight frequency to allow them to swiftly respond to shifts in market demand.
- **Category II:** Freedom of air carriers to offer fares which correspond with, and are responsive to, consumer demand.
- **Category III:** Elimination of discrimination and unfair competitive practices against American air carriers.

The guiding principles of American negotiating strategies were to trade competitive opportunities rather than oppressive restrictions and to ensure that mutual concessions were to be of a liberalizing nature. It was expected that

increased open competition will result in greater consumer benefits through increased travel options and reduced fares and rates, improved airline efficiencies through more extensive and rational routes structures, and general increase in economic welfare.

Advances Toward Open Skies

Soon after the passage of IATCA 1979, the United States achieved some success in getting multiple carrier designations and unlimited route authority without operational restrictions from South Korea, Singapore, Thailand, Finland, Belgium, and New Zealand. The smaller countries, particularly those in the Far East, by themselves did not generate much third and fourth freedom traffic with the United States. Therefore they were willing to make liberal concessions to the United States in the way of multiple carrier rights to all their major airports plus unlimited fifth freedom beyond rights. In return, they would have the benefits of the lucrative fifth freedom traffic going to and from the United States. On the other hand, larger countries such as Japan, the United Kingdom, France, and Italy by themselves generate a tremendous amount of third and fourth freedom traffic with the United States. Therefore they were less willing to concede fifth freedom rights without substantial reciprocity. Also, fearing domination by the larger and more numerous American carriers, the larger countries resisted American attempts to obtain multiple carrier traffic rights and unlimited capacity and flight capacity. The United States also had difficulty negotiating with Brazil and other Latin American countries because the South Americans have always had a tradition of tight economic control over civil aviation.

The United States had much greater success in seeking increased freedom of pricing to counter the success of Freddy Laker Airways which had diverted a large portion of the tourist market from the scheduled airlines by providing low cost service across the North Atlantic. In the first post-Bermuda II Agreement signed with Israel in early 1978, the United States insisted on and got a mutual disapproval provision which ensured that fares can only be disapproved if **both** governments disallowed them. Shortly after, in an agreement with The Netherlands, the country-of-origin rule of pricing principle was adopted. This rule stipulated that each contracting party had the exclusive right to approve or disapprove prices for one-way or round-trip carriage commencing in its own territory. These two liberal concepts were widely adopted in subsequent bilateral agreements. (The country-of-origin rule was widely used to liberalize charter operations worldwide.) Government intervention in pricing was generally limited to the prevention of predatory or discrimination pricing, protection of consumers from unduly high monopoly fares, and protection of airlines from the prices of others that are artificially low because of government subsidy.

Perhaps the greatest advances in freedom of pricing were achieved in Europe where tight economic regulation of fares prevailed. Under the shadow of the 1978 CAB show-cause order, the United States managed to convince the European Civil Aviation Conference to agree, on several occasions, to liberalize air

fares within broad zones of reasonableness. These agreements represent, for the first time, a successful regional approach to free competitive pricing.

A multilateral aviation agreement with the European Civil Aviation Conference was signed in October 1984. The price-fixing machinery is complicated, but the basic features are as follows. Reference fares for round-trip trans-Atlantic scheduled passenger services between city pairs in the United States and Europe are established once a year, based on cost and capacity data supplied. Different reference fares are set for basic, shoulder, and peak periods differentiated by country and directionally defined by the origin of the flight. Then, different zones of reasonableness are established for each city pair and for each class of service. For instance, in the first year of operation in 1984, the reference round-trip fares for New York-Frankfurt (U.S. originating) were as follows:

Basic season (September 15 to May 14):	\$1,221
Peak season (May 15 to September 14):	\$1,321
Shoulder season (None)	

The initial zones of reasonableness for each class of travel were as follows:

<i>Deep Discount</i>	<i>Discount</i>	<i>Economy</i>	<i>Business</i>	<i>First</i>
54–70	70–80	80–120	100–130	130+

This means that any American or participating European airline could set a round-trip economy fare of not less than 80 percent below or more than 120 percent above the peak season reference fare of \$1,321 for a passenger traveling economy class from New York to Frankfurt and back if the flight begins between May 15 and September 14. As long as the fare is within the prescribed zone of reasonableness, all participating governments must approve or “refrain from notifying dissatisfaction” with the fare filed by the carrier.

Additionally, there have been great advances in liberalizing bilaterals among European countries. The United Kingdom, in particular, has led with liberal bilaterals with The Netherlands, West Germany, Ireland, and Luxembourg.

Impediments To Open Skies

There are many obstacles to open competition associated with Open Skies. One of them is the issue of public subsidies. It was well known that the money-losing Anglo-French Concorde was viable only because of heavy subsidies by the British and French governments. Alitalia fell so far into the red one year that the Italian government simply converted its existing debt into equity, thus relieving the inefficient airline of its huge interest burden. But no airline was more favored by subsidies than the SAS because it is supported, not by one, but by the three governments of Denmark, Norway, and Sweden. Also, many airlines are encouraged by their governments to operate below cost to establish an identity in new markets. Ireland’s Aer Lingus, for example, operated the North Atlantic routes at a loss, as its main function was to bring tourists to Ireland. And

some carriers even receive free government goods and services.⁶

But the more serious impediment to free enterprise in international aviation is the prevalence of discriminatory practices. Listed below are some examples.

- Many foreign governments ensure that their flag carriers have the inside track. For example, the Portuguese government makes a list of Portuguese emigrants available to her national carrier, TAP. For a long time, Canada insisted that all immigrants travel to Canada on Canadian airlines. Brazilian laws provide incentives for shippers to use native air carriers.
- Many foreign countries insist that foreign airlines must use their exclusive ground handling services which provide expensive and inefficient services in Italy, Argentina, Ecuador, Japan, Kenya, and Peru. At Tokyo's Narita Airport, for example, in the past only Japan Airlines had a dedicated and fully computerized cargo terminal. It has also been recorded that warehousing and customs requirements were, at least at one time, discriminatory in Belgium, Canada, France, West Germany, Italy, Mexico, Taiwan, Japan, South Korea, and the United Kingdom.
- In the area of reservation control, the airlines of countries such as France, Italy, and Germany deliberately place American carriers at a disadvantage by denying them full access to their computerized reservations systems. Worse still, in Japan, Belgium, Portugal, Italy, and Scandinavia, the national airlines not only own some of the travel agents (illegal in the United States), but they also control what the agents can see on their screens.
- Many governments charge excessive user fees at their international gateways to cross-subsidize their smaller airports which are usually used only by their domestic airlines. Japan imposed a noise charge most heavily on transoceanic B747 aircraft although these wide-bodied jumbo jets are quieter than the noisy narrow-bodied jets used on Japan's domestic network. In U.S. Congressional hearings, it was reported that American planes were charged \$1.53 a gallon for jet fuel in Israel while the national carrier was only charged \$1.00. And India once charged a fuel tax only on international charters because essentially she did not operate them.
- Finally, even if under discriminatory conditions, foreign carriers make a profit in some countries, they face currency conversion problems in Ghana, India, Kenya, Nigeria, Pakistan, and Taiwan. Sometimes there is a total blockage of remittances altogether, which caused Pan American to completely withdraw from Zaire.

Continued dissatisfactions with the disproportionate amount of fifth freedom traffic carried by American air carriers has also acted as a brake towards the Open Skies concept. In this regard, Germany and the United States reached an agreement in 1993 in which the United States agreed to a two-year freeze on the

number of flights to Germany to allow Lufthansa time to restructure and privatize. Several countries, including Japan and France, have also indicated their intentions to renegotiate their bilaterals with the United States, citing similar complaints of imbalance in the carriage of fifth freedom traffic.

The Encirclement Strategy

In 1979, the Director of the Bureau of Pricing and Domestic Aviation at the now defunct Civil Aeronautics Board (CAB) outlined the Encirclement Strategy.⁷ He noted that pressure could be placed on Italy and France through whatever increased competition could be negotiated with Greece, Spain, Portugal, and Yugoslavia. Britain, on the other hand, could be pressured to concede to American demands by concluding liberal agreements with neighboring countries such as Belgium, The Netherlands, and Finland. All of these would serve to divert Italian, French, and British-bound traffic to other European gateways served by cheaper scheduled services and inexpensive charters which were then governed by the liberalizing country-of-origin rules. The same Encirclement Strategy was used against Japan, using the liberal bilateral agreements concluded with South Korea, Singapore, and Thailand as leverage.

Subsequent and recent developments have shown that the Encirclement Strategy worked. Britain was forced into renegotiating Bermuda II and accepting more liberalizing terms.⁸ France was forced into coming around. Germany was induced to sign a more liberal bilateral because of concerns that KLM might make inroads into its U.S.–Germany traffic. Japan eventually had to accede to American demands for multiple carrier designations.

Recent Developments

These increased route and carrier liberalization led to strategic global alliances. The major ones are the following:

- British Airways, Qantas, Air Russia, and USAir
- KLM and Northwest Airlines
- American Airlines and Canadian Airlines
- Air Canada and Continental Airlines
- Air France and Sabena
- SAS and British Midland
- Delta, Swissair, and Singapore Airlines
- United, Lufthansa, and Thai International
- American Airlines and Japan Airlines
- Japan Airlines and Lufthansa

The advantages of strategic alliances are in coordinated promotions and frequent-flier programs, code sharing to gain priority in computer reservation

systems, coordinated flight schedules for improved networking, sharing of airport terminal space, and overall economies of scale. Global alliances are the result of liberalization in international aviation but they also promote Open Skies in that international corporate linkages and interests break down national barriers.

Another recent development is the complete or partial privatization of national flag carriers such as British Airways, Air Canada, Alitalia, SAS, Lufthansa, KLM, SABENA, and Qantas. Pakistan, Brazil, and South Africa are making efforts to privatize their flag carriers. Privatization of airlines does much to remove much of the incentive for governments to protect them, thus paving the way for open competition.

With privatization and deregulation comes consolidation. For example, Australia deregulated its domestic airline industry in 1990. By 1992 Qantas and Australian merged. Domestic mergers are often desirable to position the strengthened carrier to play a larger role in global alliances⁹ or to compete with other mega carriers. Partly for this reason, Air France was allowed to acquire UTA and Air Inter, and British Airways was allowed to merge with British Caledonian. But consolidation reduces competition in domestic markets which makes liberalized bilaterals more attractive.

Exporting Deregulation and Open Skies

The overall success of airline deregulation in the United States since 1978 served as a model to other countries. In 1987, Canada deregulated airline operations in the southern half of the country and called for more liberal bilateral agreements. Australia soon followed in 1990. Restrictions in bilateral agreements between European Community (EC) countries are being eliminated as part of the overall unification effort. The goal is full liberalization of international aviation within the European Community and complete Open Skies in 1997. Member states of the European Free Trade Area (EFTA) have expressed interest in joining the EC Open Skies. The concept of a Single European Market as advocated by the EC Council of Ministers and the broader based ECAC offers the prospect of replacing bilateralism with regionalism. This would permit the unrestricted carriage of sixth freedom traffic. For example, Lufthansa would be able to pick up traffic in London and carry it to Rome via Frankfurt. As barriers to free trade are rapidly removed, the Europeans will move one step further and negotiate with other countries on a multilateral basis.¹⁰

The recent United States-Canada bilateral aviation agreement signed in 1995 permits American and Canadian airlines to serve all points in either country. There is a three-year phase-in period, which expires in 1998, for additional service by United States carriers to Toronto, Montreal, and Vancouver. These fares are subject to the double-disapproval standard (to be disallowed only if both countries agree to do so to prevent predatory or monopolistic pricing).¹¹ A trans-border Open Skies regime already exists between the United States and Mexico.

The Japanese government has recently proposed the creation of a transborder Open Skies market for Japan, Korea, and China. In fact, Japan, Taiwan, Korea, and Hong Kong already have fairly liberal access to each others' markets. Also, the Association of South-East Asian Nations (ASEAN) has been discussing the possibility of creating a liberalized air transport bloc in the region. It appears that with the exception of China, which has traditionally pursued restrictive policies in bilateral negotiations, the Far East will follow the lead of the United States and Europe in the pursuit of Open Skies.

Today, the only parts of the world that have resisted Open Skies are South America (with the exception of Chile, Ecuador, and Panama), Africa, and the Middle East.

Impact on IATA

When the Civil Aeronautics Board issued the show cause order in 1978, the International Air Transport Association (IATA) reacted strongly by accusing the United States of forcing American anti-trust laws on to the rest of the world. Nevertheless, after an internal study and several meetings, IATA agreed to restructure itself in 1979.

Soon after its inception in Havana in 1945, IATA assumed its role as a regulator of international air fares occasioned by Bermuda-type bilateral agreements. Three regional traffic conferences were created and generally met once every two years to establish international fares and rates. All fares had to be *unanimously* approved by both the participating member airlines as well as their respective governments before they could be enforced, again generally for two years. Agreements were published in the Manual of Traffic Conference Resolutions. Airlines that charged more or less than what was agreed upon were heavily fined.

The restructuring in 1979 resulted in IATA activities being grouped into trade association activities covering legal, technical, baggage, clearinghouse, and ticketing functions and tariff coordinating activities for setting fares and rates. With respect to tariff coordinating functions, IATA does not generally regulate international fares in the North American and European markets, which are now governed mostly by multilateral agreements with broad zones of reasonableness and carrier-specific fares.¹² In Asia, three large non-IATA airlines (Singapore, Thai International, and Cathay Pacific) forced IATA member airlines such as Japan Airlines to respond in their territory with non-IATA sanctioned or open-rated fares to meet the competition. In the rest of the world, rate-making traffic conferences have been replaced by smaller sub-group meetings. Fare agreements are for shorter periods, usually for six months, and often, unanimous consent is no longer required.¹³ Where competition from non-IATA airlines or charters is fierce, zones of reasonableness or even open-rated fares have been adopted to allow member airlines to set competitive prices and to accommodate changing market conditions. Thus, for all intents and purposes, IATA is no

longer the fare-setting cartel it once was. Most of its functions today involve trade association activities.

Conclusion

Despite impediments, setbacks, and recalcitrant states, the United States has led the world inexorably towards an international regime of Open Skies with multiple carrier designations and unrestricted access to gateway cities without capacity constraints or discriminatory practices, and with the right to set competitive fares and rates to meet market demand for all six freedoms of the air traffic. Domestic deregulation; the creation of regional aviation blocs and multilateral negotiations; privatization and consolidation of airlines; and global alliances all contributed towards the deregulation of international aviation. But the ultimate goal of international Open Skies is the mutual granting of the rights of cabotage, allowing foreign airlines to operate flights serving domestic city pairs.

Although the American-Canadian Bilateral Agreement of 1995 did not go far enough in removing the traditional prohibition on cabotage, fearing foreign domination of domestic aviation, there have already been steps taken in this direction. When Australia and New Zealand signed the Closer Economic Relationship Agreement, Air New Zealand was allowed to operate on Australian domestic routes beginning in 1993, essentially granting the right of cabotage. Also, in 1997 when the European Community completely embraces Open Skies, all European airlines will enjoy the rights of cabotage within the EC. Only then will international skies be truly open.

ENDNOTES

1. Five Freedoms of the Air:

1. An airline of one country has the right of innocent passage to overfly another country en route to a third country with pro forma approval.
2. An airline of one country has the right to land in another country for technical reasons without offering any commercial service to or from that point.
3. An airline has the right to discharge commercial traffic originating from its own country of registry, into another country.
4. An airline has the right to pick up traffic from another country to be discharged into its own country of registry.
5. An airline has the right to carry traffic between two countries outside its own country of registry as long as the flight originates or terminates in its country of registry.

2. For a long time, Singapore had a pooling agreement with Indonesia whereby the revenues generated from traffic between Singapore and Jakarta were shared, even though Singapore Airlines carried much more passengers than Garuda. In pooling arrangements, the carrying airline is compensated for variable costs, and sometimes there is a limitation clause to limit the extent of pooling.

3. See Gowan, Roy (1979), Proceedings, Papers and Dialogue from the IATA 14th International Air Transport Public Relations Conference, Dublin, October 4-5, pp. 18-21.

4. Hearings before the Subcommittee on Aviation of the Committee on Commerce, Science and Transportation, United States Senate (95th Congress Second Session 1978 on S.3363) pp. 19–20.
5. Report of the Subcommittee on Investigations and Oversight of the Committee on Public Work and Transportation, U.S. House of Representatives, on the Improvement Needed in the Implementation of the United States International Aviation Policy (98th Congress First Session 1983), p. 3.
6. See Civil Aeronautics Board (1975), Government Ownership, Subsidy, and Economic Assistance in International Commercial Aviation, Washington, D.C.
7. "Civil Aeronautics Memo by Michael E. Levine," *Aviation Daily* (March 8, 1979), pp. 1–7.
8. A number of liberal amendments to Bermuda II were signed between 1978 and 1982.
9. See Oum, T., Taylor, A.J., & Zhang, A. (1993). Strategic Airline Policy in the Globalizing Airline Networks. *Transportation Journal* (Spring), pp. 14–30.
10. Such negotiations were approved for non EC countries such as Norway and Sweden.
11. A similar closer Economic Relationship Agreement was signed between Australia and New Zealand creating a Single Aviation Market.
12. See Dresner, M.E., & Windle, R. (1989). The Effects of Liberalization on European Air Transport. Paper presented at the Transportation Research Forum, Williamsburg, VA, Oct. 11, 1989.
13. For a discussion of voting procedures at IATA tariff conferences, see Haanappel, P.C. (1984), *Pricing and Capacity Determination in International Air Transport*, Deventer, The Netherlands: Kluwer.

TRENDS IN AIRLINE LABOR PRODUCTIVITY AND COST IN EUROPE

Fariba Alamdari
Cranfield University, UK

ABSTRACT

Following the liberalization of air services in Europe in 1988 and more liberal agreements with countries outside Europe, European air carriers have come under increasing pressure to reduce costs. This has been in response to growing competition in their markets from fellow European carriers and the U.S. airlines. Labor has been the most obvious area of costs for airlines to tackle. This paper analyzes trends in the numbers of employees, labor wages (labor costs per employee) and labor unit costs (labor expenses per available ton-kilometer) of European carriers from 1985 to 1995. Labor costs compare average take-home pay for employees, adjusted for cost-of-living differences between countries. It also compares labor pay between airline and manufacturing. The results indicate that European airlines reduced unit labor costs by increasing productivity. When taxes and social costs are deducted from the labor costs, there appears to be a large difference in take-home pay between countries. It was also found that most airlines in the sample pay their employees, on average, more than employees working in the manufacturing industry in their respective countries. The gap between the two however, was narrowing. It is recommended that incentives policies such as profit sharing or employee share ownership could become more effective in reducing real wage levels while leading to further improvements in productivity.

THE MOVE TOWARDS REDUCING LABOR COSTS

With the passage of the first liberalization package in 1988, European airline markets became more competitive. It was not until the passage of the third liberalization package in 1993 that almost all restrictions were removed from airline markets. Such changes in the airline regulatory environment affected many aspects of the aviation industry. The economic impact of these changes has been widely discussed in previous studies (Cranfield, 1997; British Midland, 1997; and CAA, 1993 and 1995). The airlines' main response to the growing competition in Europe has been to reduce labor costs as part of a range of cost-cutting activities. The intensified level of international competition from major carriers outside Europe, mainly U.S. airlines, and the need to recover from financial deficits during economic recession have increased the need for the European carriers to reduce labor costs.

Labor costs are one of the areas over which managers can exert influence and normally account for one quarter to one third of an airline's operating costs (see figure 1). The array of measures used to reduce labor costs includes: voluntary or compulsory staff redundancy, reduction in wages, introduction of two-tier

Figure 1: Airline Labor Costs as Percentage of Total Cost—1995

wage rates, contracting out labor, increased use of part-time and temporary employees, and franchising.

Efforts to reduce costs and bring about improved working practices have met strong resistance in many European countries. Since 1993, work stoppages have affected SAS (ground staff), Austrian Airlines (flying crew), TAP Air Portugal (all staff), Air France (all staff), and Alitalia (pilots). The British Airways' pilots union recently settled a dispute after a threatened strike, and their catering staff introduced a one day strike in May 1997 following the announcement that their business was to be sold. The climate is gradually changing however, and unions are beginning to take seriously the actual or threatened withdrawal of government support. There is also evidence of unions making demands for a greater say in management, profit sharing, and share ownership—similar to those made by their U.S. counterparts in the 1980s. In one example, the pilot union Balpa demanded a U.S. style Employee Share Ownership Plan (ESOP) in exchange for considering a proposed wage freeze (Airline Business, May 1997).

This paper analyzes the trend in the number of employees, labor costs (labor costs per employee and labor costs per ATK), and labor productivity (ATK per employee) in an aggregated form over the period of 1985 and 1995. Next, the individual EU airline labor costs and productivity are compared for the three intervening years of 1985, 1989, and 1995. Another comparison is made between the average take-home pay for employees of the major EU airlines and the employees of manufacturing industries in the same countries. The focus of this paper is on the EU airlines. For a comparison of the productivity and labor costs of EU airlines with non-EU carriers (see Oum and Yu (1995), Alamdari et al. (1995), and Alamdari & Morrell (1997)).

EU Airline Employment Levels and Productivity

One important policy adopted by European carriers to reduce labor costs has involved staff reductions. Some carriers have been more successful in reducing staff numbers than others. Implementing this policy may involve factors beyond management's control, such as cultural and social influences, the strength of labor unions, and government attitudes. For example, it has been more difficult for carriers such as Iberia to in a country with over 20 percent unemployment. When Iberia offered a restructuring proposal in December 1994 that included 2,120 layoffs, they became victims of two one-day strikes that cost the carrier \$16 million in lost revenue.

Figure 2 illustrates the development in the level of employment for a sample of major EU scheduled airlines between 1985 and 1995. The year 1985 is used as the base since the movement towards liberalization began in 1985 through more liberal air services agreements between EU member countries.

Figure 2: EU Airline Employment & Productivity

It ought to be mentioned that the reduction in the number of employees since 1991 has not always meant a loss of jobs to the industry as a whole. In some case labor moves from one organization to another. This may happen when airlines outsource some of their activities such as maintenance and catering. For example, Shannon Aerospace in Ireland carries out aircraft maintenance on behalf of a number of European carriers including its shareholders, Swissair and Lufthansa. Lufthansa transferred a significant amount of maintenance work to this company thereby transferring jobs to a lower wage country within the EU. In other cases, airlines have moved an entire function or part of it to lower cost countries outside the EU resulting in net job losses. In 1992, Swissair transferred its revenue accounting tasks to a firm employing over 100 staff located near Bombay, India (Donoghue, 1993). A recent study by Shonfield (1997) for the European Commission indicates that only isolated examples of competitive

undercutting of pay and conditions by firms exploiting labor cost differences between countries. There is evidence from Germany however, that companies are increasingly using the threat of relocation to bargain for changes in work practices at home.

Although the level of employment by EU carriers has declined in recent years, staff productivity measured by ATKs (Available Ton-Kilometers) per employee has increased. Figure 2 illustrates employee productivity trends for EU airlines from 1985 to 1995. The increase in the labor productivity is more noticeable since 1991—three years after the passage of the first liberalization package in 1988. The decline in employee numbers was accompanied by higher labor productivity. In theory, as long as higher productivity is not matched by higher wages, the airlines should be more competitive. The economic recession of 1990–1993 may also have played a role in increasing pressure for higher productivity.

Labor Cost per Employee

Clearly reductions in the number of staff or increases in labor productivity do not necessarily translate into lower labor costs. It is possible to lower the number of employees and at the same time ask for increased productivity from the remaining staff in return for higher wages. In order to assess the aggregated EU airline labor costs, it is important to analyze the average wage and salary levels of the EU carriers per employee.

To remove the impact of exchange rates, each carrier's expenses per employee are expressed in their local currency and indexed on 1985 as the base year. Then, labor expenses (in an index form) are weighted by their staff numbers and aggregated to arrive at a composite unit to represent EU airlines' average labor costs. All figures are also adjusted by local Consumer Price Indices (CPI) to establish employee expenses in real terms expressed in 1995 prices.

It can be seen from figure 3 that carriers overall have experienced a rise in their labor costs in real terms. The average expenses per employee have risen by almost 15 percent over the entire period. This confirms the finding of an earlier study that the transformation of labor costs in Europe had not yet occurred (Robinson, 1994). Therefore, it could be concluded that airline employees have increased their productivity in return for a slightly higher salary in real terms.

Unit Labor Cost

Reducing labor unit cost without adversely affecting service levels ought to be the prime aim of the airlines in Europe, especially in the more recent years when European aviation markets have become increasingly liberalized and highly competitive. Labor unit cost measured by average labor cost per ATK, establishes the amount of labor needed to produce one ATK. Such a measure not only takes into account the wage costs but also the employee productivity.

The overall trend in EU airlines' unit labor cost as illustrated in figure 3 indicates that EU airlines have been successful in controlling and reducing their unit labor cost in real terms. This is especially true since 1991 because the rate of increase in staff productivity has been greater than the increase in average wage levels (as illustrated in figures 2 and 3). Such trends have also been affected by outsourcing of certain activities.

Figure 3: Labor Costs (1985-1995) in Real Terms

FACTORS AFFECTING BENCHMARKING AIRLINES' LABOR COST AND PRODUCTIVITY

While it is always very useful to compare air carriers' performance with one another, it is of great importance to first consider internal and external factors that can influence a carrier's performance. In assessing airline labor costs, two main components need to be analyzed:

1. Labor remuneration, and
2. Labor productivity.

Clearly, each of these is driven by a range of factors which should be considered in making judgements.

Remuneration levels are affected by a variety of factors including the local cost of living, taxation system, and the nature of the broad package offered to the employees including share ownership schemes, profit sharing, health care, accommodation, education, and pensions.

Labor productivity is affected by many factors including the level of work contracted out or contracted in, level of temporary staff, duty time limitations, the nature of the carrier's network (e.g. stage length, scheduling, and hub orientation) as well as labor agreements.

Remuneration

Cost of Living. The cost of living varies significantly from one country to another. If employees working for, say, Olympic Airways and Swissair were to receive the same levels of pay, the employees working for Olympic (who are assumed to live in Greece) would have a substantially higher standard of living than the employees working for Swissair (see Appendix A for international living costs in European countries).

Converting the salaries of employees for various airlines into a common currency using market exchange rates does not take into account these cost of living differences. By using Purchasing Power Parity (PPP) exchange rates, the analysis can be amended to compensate for the difference in cost of living between countries. Purchasing Power Parity exchange rates convert currencies on the basis of what money will buy rather than on the basis of market valuation. Converting salaries—or indeed costs—using PPP exchange rates produces differences in the results of carriers' labor costs based in different European countries (see Appendix B for the rates).

Social Costs and Taxation. The amount the employers contribute towards the social costs as part of labor costs can also vary from country to country. Even if labor unions accept a wage freeze, airlines operating in countries with high social costs and taxes are still limited in how much they can reduce their labor costs (see Appendix C for hourly wage rate and other labor costs in European countries). Sabena is one of the airlines faced with this problem. The social cost for Sabena accounts for some 30 percent of overall salary costs (Airline Business, 1997).

Taxation systems also vary significantly from one country to another. It is perfectly possible for employees working for air carriers in different countries that pay similar salaries, to receive radically different levels of net pay due to different taxation levels (see Appendix D for the average income tax rates in different European countries).

This discussion certainly does not provide a complete picture of disposable or discretionary incomes. For example, the low taxes paid by citizens in one country may reflect low levels of state involvement in providing services. For their higher taxes, those in some countries may receive some state services such as medical care not available. Nonetheless, the analysis illustrates that uniform salary levels can mask differences in take-home pay.

Employee Profit Sharing/Ownership. Some carriers have implemented profit sharing schemes which might have a significant impact on the employees' willingness to accept lower wages. Ideally these should be taken into account in an analysis of employee remuneration. For example, the British Airways (BA) employees shared £66 million from the carrier's 1994/5 profits. They had a choice of receiving cash or shares (British Airways News, 1995).

In order to reduce labor costs, a number of U.S. carriers have traded shares in the company in return for reduced wages and increased flexibility in work rules. Trade unions at United Airlines in August 1994 accepted a ten percent pay cut and a package of work-rule concessions worth \$5 billion over six years in return for a 55 percent stake in the company (see Alamdari and Morrell, 1997).

Similar agreements exist between management and employees at Northwest, USAirways, Southwest Airlines, and TWA. A straight comparison of airline employee remuneration does not necessarily provide a fair analysis. Staff may be willing to accept lower levels of income in return for equity that may increase in value and pay dividends.

Pension Costs. Pension costs are normally not included in the labor cost analysis. A good pension plan however, could compensate for lower wages or more flexible working conditions. Lufthansa employees were part of the state pension plan until the airline was privatized and the responsibility returned to the airline. The government was required to pay Lufthansa DM1.6 billion so the airline could maintain the benefits and to enable the last stage of privatization to proceed (Morrell, 1997).

Other Employment Benefits. Most studies do not take into account the other costs of employment. The range of benefits offered to employees in terms of health insurance, education, accommodation, sport facilities, crèche, travel, etc. are surely not immaterial to either the airline providing such benefits or to the employees receiving them.

Productivity

Labor productivity is generally defined as the relationship between the level of employment and total output (available ton-kilometers). The major problem in relating the number of employees to an airline's production is the change over time in the share of production performed **by other firms** (contracting out) and conversely, the change in work performed by the airline's employees **for other firms** (contracting in). Maintenance, ground handling, and catering staff are categories most likely to be subjected to these distortions.

Recently, some airlines have considered contracting out all of their information technology, computing requirements, and maintenance. Lufthansa shifted its aircraft maintenance to Shannon aerospace; BA outsourced its catering and maintenance; and Air France outsourced its ground handling at London Heathrow to Servisair. Capacity pools, block space, and code-sharing agreements effectively contract out flight operations to other carriers, thereby distorting flight crew and maintenance staff numbers.

In the past, many of these outsourcing agreements involved reciprocal services, with one carrier performing ground handling at its home base for other carriers and vice versa. This might also be the case with more recent alliances with

each airline's sales staff working for both alliance partners in their respective home countries.

The extent of hubbing undertaken by an airline can also affect pilot productivity. Hubbing carriers develop schedules to maximize the number of connections with aircraft and pilot utilization becoming secondary considerations. KLM's latest schedule is arranged to have many short haul aircraft stay overnight at out-stations. The aircraft arrive at the out-stations late at night and depart early in the morning in order to connect with the first wave of departures at Amsterdam. Flight time duty limitations may mean that the flight crew that flies the last flight to the outstation is not able to operate the first flight of the morning—having to wait for the midday or evening flights from the out-stations. This inevitably reduces flight crew productivity.

INDIVIDUAL AIRLINE LABOR COSTS AND PRODUCTIVITY

A number of European carriers' productivity, wage rates, and unit labor costs are analyzed and compared for the period 1985 to 1995. Where possible, factors discussed above are taken into account to provide a better comparison.

Labor Productivity

Figure 4 illustrates trends in employee productivity (ATK per employee) for a number of EU airlines (airlines are ranked according to their 1995 performance). It can be seen that the majority of airlines have continued to increase their labor productivity over the years with KLM, Lufthansa, and British Airways growing at a higher rate than other carriers. The only carrier that has not achieved growth in employee productivity in recent years is Sabena. This is largely due to a radical reduction in capacity since 1991 (primarily confined to intercontinental routes). Despite the decrease in Sabena's general employee productivity, previous research showed that the airline's cockpit crew achieved the highest growth in productivity compared with other EU airlines during the period from 1983 to 1993 (Alamdari et al, 1995).

Figure 4: EU Airline ATKs per Employee

Labor Cost Per Employee

The analyses of labor costs per employee for the three years 1985, 1989, and 1995 allows a comparison between the labor costs of different carriers and established the changes in actual labor expenses.

The average cost per employee for the study air carriers, in 1995 U.S. dollars, is illustrated in figure 5. To take into account the differences in the cost of living of different countries, the Purchasing Power Parity (PPP) exchange rates were used to convert labor costs in national currencies to U.S. dollars. This technique removes the cost of living variations from the comparison. It can be seen that in most cases, the airlines' average labor cost has increased in real terms. TAP Air Portugal was the only airline in the sample that experienced declining average labor costs.

**Figure 5: EU Airline Labor Cost per Employee (1995 prices)
Using Purchasing Power Parity Exchange Rates**

Air France has continuously reduced average labor cost until the merger with UTA in 1992 when average labor costs rose. Cost-saving measures introduced by Air France in September 1993 met with considerable hostility from its work force. The resulting industrial action led to the government intervening to force the company to withdraw its proposed cuts. In exchange for reductions in salaries, the airline changed the holding company structure to allow up to 20 percent of the shares to be owned by staff (Air France, 1995). More recently, pilots and ground staff from Air France Europe, formerly Air Inter, went on strike to protest against the imposition of Air France mainline's less favorable working conditions.

In April 1996, Lufthansa responded to increasing labor costs by employing regional flight attendants based in Delhi, Bangkok, and Singapore. Sabena has concluded an agreement with its labor unions that specifies a two percent salary decrease, the loss of 730 jobs, and flexibility in working hours. British Airways

has recently announced that 5,000 of its employees would be offered voluntary redundancy.

Deducting social costs paid by both the employers and employees, and taxes from staff salary costs provides a slightly different picture. Figure 6 illustrates employee take-home wages for the year 1995. It can be seen that Iberia, Lufthansa, and British Airways employees take home a larger pay than those working for SAS and Sabena.

Figure 6: Airline Labor Wages after Tax and Social Security – 1995
Using Purchasing Power Parity Exchange Rates

Unit Labor Cost

Based on a survey of wages and employment in Europe by Towers Perrin (1997), the most important factor affecting pay increases was found to be individual worker performance. Therefore, labor costs per ATK of the sample airlines are used to relate airline labor costs to employee performance. It can be seen from figure 7 that, with the exception of Sabena, the airlines' labor cost per ATK has declined.

Figure 7: EU Airline Labor Cost per ATK (1994 prices)
Using Purchasing Power Parity Exchange Rates

It is apparent that the majority of EU carriers reduced unit labor costs mainly through increases in productivity. It is interesting to note that the two southern European carriers, TAP and Iberia, pay their employees much more than other airlines for producing one ATK while KLM and British Airways pay the lowest for the same level of output. Sabena's high labor cost per ATK stems from its lower labor productivity rather than average labor costs as illustrated in figures 5 and 6.

Airline and Industrial Average Wage Ratio

Having compared average labor costs and productivity, it is of interest to assess how airline employee wages compare with the average industry wages. Figure 8 illustrates the average wage costs of EU airlines compared with wages in the manufacturing industry in their respective countries. On average, all countries pay their airline employees more than their manufacturing employees. With the exception of the UK, the gap between the two industries has narrowed. This is related to British Airways having carried out some of its restructuring even before 1985. BA has also out-sourced some of its labor intensive and lower paid functions. This has resulted in moving the airline's average wage up.

Figure 8: Ratio of Airline to Manufacturing Labor Costs

TAP Air Portugal pays, on average, over three times more to its employees than manufacturers pay to their employees. This may be due to very low wages paid by the manufacturers in Portugal (see Appendix C), since the airline wage rate is comparable with other European carriers (see figure 5). TAP Air Portugal also has the highest unit labor costs in relation to their productivity in comparison to the other airlines in the study (see figure 7).

CONCLUSIONS

While European airlines were not successful in moderating real wages, they were able to achieve higher productivity gains. In the period before liberalization gathered pace, EU airlines achieved more modest productivity gains. Gains have been at a much higher rates since 1991. Success in labor cost reduction should ultimately be judged in terms of trends in labor cost per unit of output (QTK). This reflects both productivity gains and the degree to which labor was compensated in higher wages. In the period 1991 to 1995, unit labor costs fell by approximately 38 percent as a result of the fast growth in productivity. In the same period, wages only increased 15 percent in real terms. It appears that the airlines were paying their staff only slightly more for proportionately greater productivity. This is possible because an increase in outsourcing has a tendency to increase the average unit labor cost by reducing the number of lower paid employees while boosting productivity.

KLM, British Airways, Air France, and Lufthansa have the lowest unit labor costs. This has been achieved through high labor productivity rather than lower wage costs. However, Sabena, Iberia, TAP, and SAS have higher unit labor costs due to low productivity levels. It has to be the ultimate goal of the latter carriers to improve their labor productivity levels in order to achieve competitive unit labor costs.

Comparing the airlines net wage rates, adjusted for social charges, taxes, and cost of living differences between countries, shows that employees working for SAS, Sabena, and KLM take home much less pay than other European airlines. On this basis, the highest paid employees are those working for Iberia. The employees of almost all airlines are paid more than employees working in the manufacturing industry in their respective countries but the gap is closing.

It could be expected that European airlines will achieve further reductions in real unit labor costs, driven by productivity gains and reduced real wages. To achieve such reductions, airline management will have to adopt policies to make the best use of employee potential while providing them with incentives for accepting lower wages and more flexible working conditions. Such incentives could include profit sharing or stock option schemes and genuine involvement and participation of employees in running their airlines.

REFERENCES

- Air France (1995). Group Annual Report
- Airline Business* (1997). BA hires and fires equally. May
- Alamdari, F., Doganis, R., & Lobbenberg, A. (1995). Efficiency of the world's major airlines. Cranfield Research Report, No. 4, March
- Alamdari, F., & Morrell, P. (1997). Airline labour cost reduction: Post-liberalisation experience in the U.S. and Europe. *Journal of Air Transport Management*, Vol. 3, No. 2
- British Airways News*, 6 May 1995

- British Midland (1997). Unfinished business, A report on competition, choice and value for money in European air travel.
- Civil Aviation Authority, UK (1993). Airline competition in the single European market. November, CAP 623
- Civil Aviation Authority, UK (1995). The single European aviation market—Progress so far. September, CAP 654
- Cranfield (1997). Single market review: Impact on services—Air transport. Published by Kogan Page, London, on behalf of the European Commission
- Donoghue, J. A. (1993). Back offices, far afield and frugal. *Air Transport World*, December
- Morrell, P. (1997). *Airline Finance*, to be published by Ashgate Publishing in July
- Oum, T., Hoon, & Yu, C. (1995). A productivity comparison of the world's major airlines. *Journal of Air Transport Management*, Vol.2, No. 3/5, September/December
- Robinson, O. (1994). Employment policy and deregulation in European air transport. *The Service Industries Journal*, Vol.14, No.1 (January)
- Shonfield, D. (1997). Unpublished study for the European Commission. Income data services. The Independent UK Pay Research Body
- Towers P. (1997). Learning from the past, changing for the future. Report, London

Appendix A: International Living Costs Index – 1997

Source: P-E International, April 1997

Appendix B

	Market Exchange Rates <i>national currency per U.S. \$</i>			Purchasing Power Parity Rates <i>national currency per U.S. \$</i>		
	<i>1985</i>	<i>1989</i>	<i>1995</i>	<i>1985</i>	<i>1989</i>	<i>1995</i>
France	8.99	6.38	4.99	7.27	7.47	6.66
UK	0.78	0.61	0.65	0.57	0.62	0.65
Spain	170.00	118.37	124.70	95.30	112.00	125.00
Netherlands	3.32	2.12	1.61	2.55	2.33	2.13
Germany	2.94	1.88	1.43	2.48	2.41	2.09
Belgium	59.37	39.40	29.50	44.60	44.60	37.50
Sweden	8.60	6.44	7.13	8.15	9.29	10.10
Portugal	170.40	157.40	149.90	66.20	98.90	122.00

Source: OECD Economic Outlook, December 1996

PPP exchange rates convert currencies on the basis of what money will buy, rather than on the basis of a market evaluation. Therefore they are the rates of currency conversion that equalise the purchasing power of different currencies. This means that a given sum of money, when converted into different currencies at the PPP rate, will buy the same basket of goods and services in all countries. Thus PPPs are the rate of currency conversion which eliminate differences in price levels between countries.

Appendix C: Labor Costs – 1995 Manufacturing \$ per Hour

Source: The Economist, 27 April 1996
Note: The social costs for Spain and Portugal are estimates.

Appendix D: Average Income Tax Rates – 1996

Source: Price Waterhouse
Note: Based on \$60,000 income for a family with two children.

Appendix E: Average Hours Worked per Week

Source: UK Department of Employment, Labor Market Trends, 1996

